

# Technology Review

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## THE CHILDREN'S MACHINE

*How Computers Can Restore  
the Wonder of Learning*

BY SEYMOUR PAPERT



### ALSO IN THIS ISSUE:

- ◆ WHEN THE PENTAGON AND CIVILIAN INDUSTRIES JOIN FORCES ◆ A SECOND WIND FOR WIND POWER ◆
- ◆ DESIGN AS IF PEOPLE MATTERED ◆ HIGH-TECH HOUSE CALLS FOR SMALL BUSINESSES ◆

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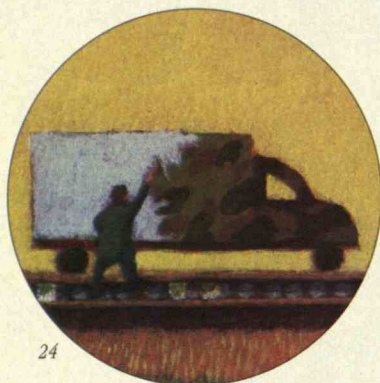
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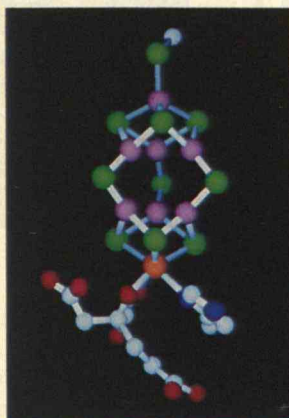
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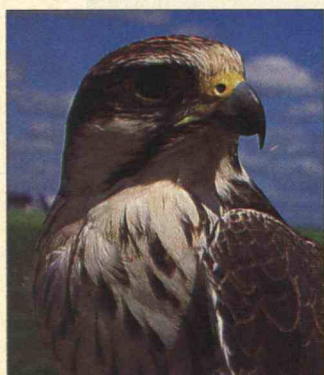
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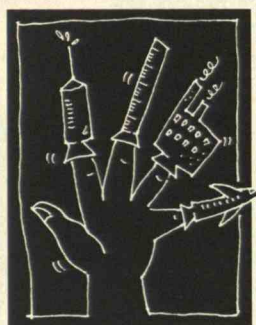
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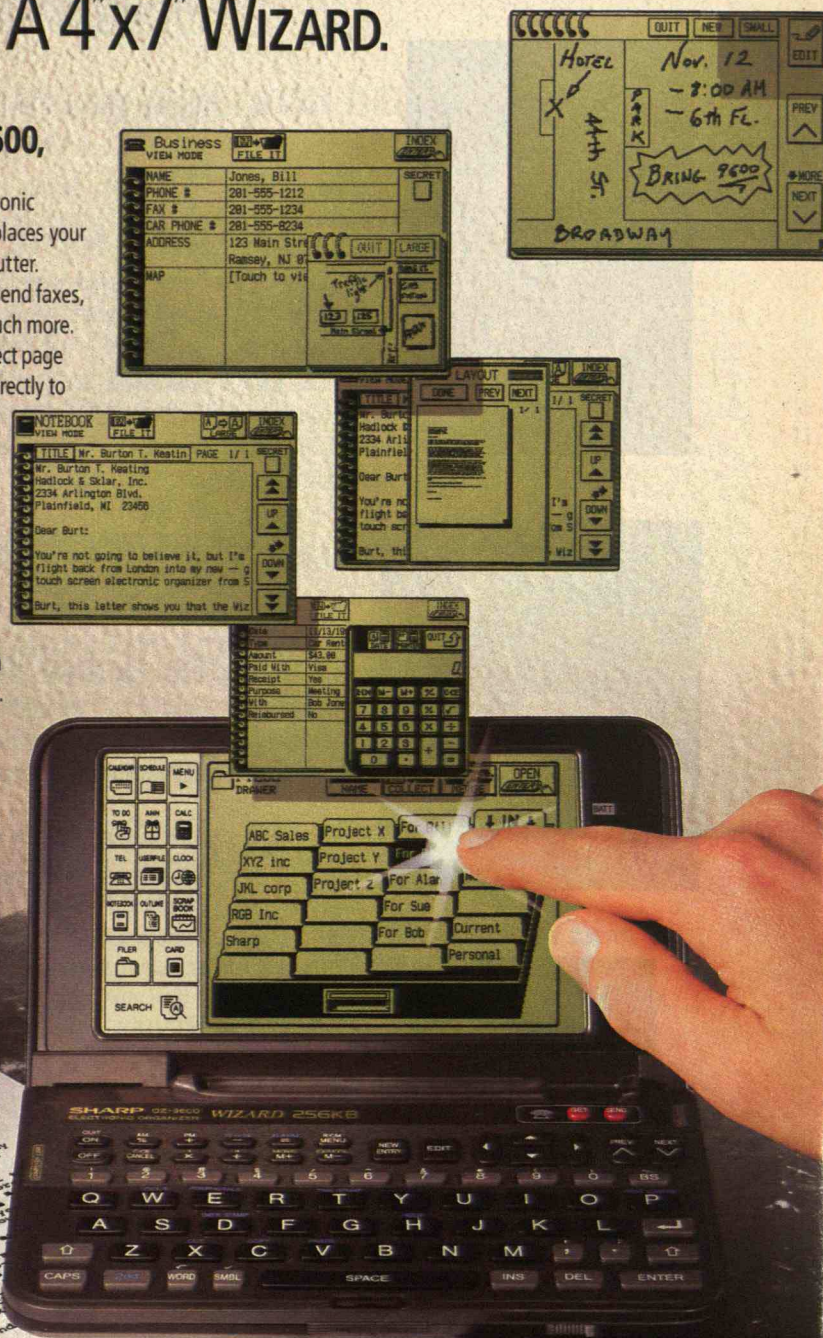
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## Challenges Ahead for White-Collar Workers

CORPORATIONS' investments in employees have traditionally focused on cultivating a sophisticated and increasingly specialized work force of professionals. The U.S. service sector, for example, has enhanced these staffs during the last several decades through enormous expenditures on training, computers, databases, and a wide range of support systems both technological and otherwise.

For a long time, professional employees were largely exempt from the vicissitudes of the market and corporate restructuring, as blue-collar and other nonprofessional labor—especially in manufacturing—was usually the target of layoffs. But in the current round of corporate downsizing, companies are cutting dramatically into their professional staffs.

The loosening of the traditional corporate commitment to professional employees is not just the result of short-term competitive and financial pressures. It reflects a dramatic restructuring of professional work. Companies may now simply retain a core professional competence and seek the remainder of traditionally in-house skills, including research and development, design, and even manufacturing and marketing, among people outside the conventional corporate boundaries. With boards of directors taking on a more activist role, even the powers—and jobs—of CEOs are being redefined.

Individuals and organizations have weathered periods of change before by reinventing themselves and anticipating the new and more effective shape of the future. General Motors once pioneered the corporate model that features competition for customers between rival divisions coupled with strong centralized staffs and financial controls. Companies such as Royal Dutch Shell have been successful in transforming large multinational organizations into what

most host countries think of as locally run, responsive national enterprises. More recently, the Japanese trading company has established another model that capitalizes on preferential access to domestic sources of capital and governmental involvement.

Each of these structures strengthened the role of professional employees. But given the global competitive forces now operating, where low-wage and nonprofessional workers frequently have access to world-class

*Professional employees  
such as engineers, no longer  
secure in the corporations of  
the "new economic order,"  
must seek alternative  
arrangements.*

manufacturing capability with a minimum of managerial assistance, none of the previous models seems predictive of the future.

What might the new business models look like? Some analysts posit that we may see alliances involving groups of skilled professionals, tied to a corporate core, undertaking short- to medium-term projects. Small groups with special expertise in engineering design have already formed for just this purpose. Software firms, for example, often rely heavily on specialist contractors to create subsystem architectures. And consultants often provide continuing services, such as benefits and executive search, to client companies.

Meanwhile, because corporations are investing heavily in administrative reforms such as total quality management (which, in order to minimize product defects, operates through diverse work teams) and employee empowerment (which broadens individuals' roles), those who do remain on the corporate roster must adopt a different view

of their jobs and rewards. Professionals will be less able to retreat behind expertise, must learn to collaborate with other professionals and nonprofessionals, and must thoroughly understand the overall business.

Companies as well as skilled professionals attempting to adapt to such changes would therefore do well to keep several admonitions in mind:

First, each of us as individuals will have to invest in ourselves more steadily, broadening as well as deepening our skills and keeping an eye on an array of disciplines previously seen as outside our spheres of interest. Learning to use computers and speak a foreign language, for example, are skills that have become prerequisites for many important business positions.

Second, corporate investments in human capital are crucial to maintain the flexibility of the leaner but meaner work force.

Third, as companies downsize they will be able to offer fewer promotions and thus will have to find new ways of measuring people's worth and capturing their commitments. Broadened work roles and greater control of work, which imply increased knowledge, power, and personal growth for individuals, are major steps in that direction.

Fourth, ease of communication between employee and employer, and between professionals and their networks of colleagues, will determine the kind of training that is mutually rewarding and will enable more productive interaction.

Finally, the societies that foster broad professional and personal growth among their citizens are more likely to build stable, productive work forces and consequently enjoy world-class economies. The new administration in Washington has a rare opportunity to build such a work force if it can succeed in its intention to massively shift resources—from defense to civilian work, for example, or by streamlining and improving education. ■

—WILLIAM J. HECHT



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# Letters

## CHEMICAL ARMS CONTROL

"Ending the Scourge of Chemical Weapons" by Jay Brin (*TR April 1993*) is an excellent examination of the Chemical Weapons Convention. The CWC signing ceremony in January signaled the end of a long, arduous negotiation process. Much credit for this achievement belongs to former president George Bush, and President Clinton must exercise similar leadership to ensure the value of the convention.

For now, the focus has shifted to the Hague, where the Preparatory Commission is establishing the means by which the CWC will be monitored and enforced. The PrepCom's accomplishments over the next two years will determine the viability of the CWC as an arms control agreement. But during this same period, a separate, equally important process will occur as the U.S. Congress considers legislation to implement the treaty. Unfortunately, Congress has remained largely removed from the chemical weapons negotiations. Few of my colleagues have demonstrated interest in chemical arms control, and it has long been my belief that Congress would not pay attention to the CWC until it arrived on Capitol Hill for action.

Perhaps the greater visibility of chemical weapons issues will lead to more interest in ensuring the adequacy of our chemical defensive equipment and training. We might also address the problems associated with destroying chemical weapons. And finally, we might recognize the need to incorporate CWC-style verification measures into an important treaty that so far has no teeth—the Biological Weapons Convention of 1972; absent any inspection regime, the BWC has amounted to little more than the paper on which it is printed. One clear and welcome sign of leadership from President Clinton would be support for such measures.

REP. H. MARTIN LANCASTER (D-N.C.)  
House Armed Services Committee  
Washington, D.C.

Jay Brin fails to acknowledge the dangers inherent in the CWC. In agreeing

to this treaty, the United States is willingly committing itself to a chemical weapons "ban" that is neither global nor verifiable and that in effect requires us to unilaterally disarm.

The history of attempts to limit chemical warfare does not bode well for the CWC. The Geneva Protocol of 1925, which banned the use of chemical weapons, was proven over and over to be ineffective. The CWC attempts to go beyond the protocol by banning not only the use of chemical weapons but also the development of new ones, and by providing for the destruction of existing stockpiles. Yet the reason the 1925 treaty did not attempt this in the first place was that it recognized compliance to be unverifiable, and in fact compliance is still unverifiable today. Supporters of the CWC argue that the specified inspection regime is likely to detect any violation of military significance while allowing countries to protect legitimate military and commercial secrets, but more realistic observers point to historical examples that cast doubt on such an assertion. To see that detection is impossible even with extremely intrusive inspection, one need only consider Iraq's success in hiding its nuclear weapons program.

Virtually any nation can retain or acquire the ability to conduct militarily significant chemical warfare, and the CWC—like prohibitions on first use of chemical weapons, on production and stockpiling of biological weapons, and on proliferation of nuclear arms—is certain to be ignored by some states that choose not to become signatories, and to be honored in the breach by only some of those who do. Mr. Brin places great stock in export controls as a means to limit the spread of chemical weapons, but such controls have consistently proven inadequate, unenforceable, and susceptible to circumvention and disregard. Just last month, the State Department announced that despite a U.N. embargo and worldwide recognition as a renegade state, Libya was constructing another chemical weapons plant with assistance from firms in Western Europe and Japan.



Ironically, too, the technological abilities of the United States put us at a disadvantage. The CWC requires the elimination within ten years of all chemical arms, but signatories that lack the technology to meet that deadline can have it extended. Thus vast quantities of chemical arms will be legally retained by others for at least five years after all U.S. deterrent weapons have been destroyed. For instance, the former Soviet Union holds the world's largest arsenal of chemical weapons, and it clearly cannot be eliminated within ten years.

Another dangerous aspect of the CWC is that it could discourage efforts to redress the current inadequacies of U.S. chemical defenses. All arms control treaties have been followed by political pressure to limit research, development, and deployment of defenses against the weapons that have purportedly been controlled. Witness the pressure that is already mounting to close Fort McClellan, the only live-agent defense training facility in the Western world. The consequences could be serious: operations Desert Shield and Desert Storm demonstrated that despite the assurances of the Department of Defense, our protective equipment against chemical and biological attack has numerous deficiencies.

While the goal of ridding the world of chemical weapons is admirable, it is reckless to base national security policy on hope rather than experience. President Clinton should insist that the arms control activities of his team not fall prey to the same wishful thinking that led to our current position. He should ensure that the Senate ratification process be open and critical, even to the point of seriously considering non-ratification, and he should support the programs the United States needs to maintain adequate chemical and biological defenses and improve intelligence and verification.

AMORETTA M. HOEBER  
President  
AMH Consulting  
Arlington, Va.

### SUPERSONIC COMMERCE

In "The Rebirth of Supersonic Transport" (*TR February/March 1993*), Robert Rosen and Louis Williams provide a comprehensive overview of the technologies that must be developed to make supersonic commercial transport feasible and environmentally acceptable. But a focused technology-development program sponsored by the government will be needed to achieve this goal. Otherwise, U.S. industry will not risk the billions of dollars required.

A fleet of supersonic transports could produce an increase in productivity comparable to that seen with the introduction of jet propulsion 35 years ago. Moreover, the global nature of commerce today and the anticipated increase in long-range international travel makes the development of a high-speed airliner inevitable. Companies and governments in Europe, Russia, and Japan recognize as much, and the country whose industry masters the relevant technologies will secure the leading role in the commercial aviation market. So far, U.S. leadership in aerospace technologies provides exports that are second only to agriculture and first within manufacturing. But maintaining that leadership requires aggressive research and development by a partnership of U.S. companies, academia, and government agencies, with the NASA High-Speed Research Program as the centerpiece.

BRUCE L. BUNIN  
Program Manager for High-Speed  
Civil Transport  
McDonnell Douglas Corp.  
Long Beach, Calif.

### TEENY TECHNOLOGY

In "The Really Little Engines That Might" (*TR February/March 1993*), Fred Hapgood does not fully convey the central importance of molecular nanotechnology. The ability to build materials molecule by molecule is a fundamental goal for manufacturing. The arrangement of atoms determines the properties of everything we make, and with precise, mechanical control of molecular motion and placement, products can be made far

stronger, lighter, cleaner, and more efficient. Precisely structured materials made of carbon can have 70 times the strength-to-density ratio of common engineering alloys, and precisely structured computer devices can store a billion bytes of data in the same amount of space present chips use to store a single bit. Further, exact control of molecular motions means that such items could be manufactured without by-products.

Because we lack the necessary tools, we are far from such feats today. Yet computer modeling can already describe the key devices and processes. Chemists are building ever-larger molecules, including molecules that can actually assemble themselves, and physicists are now using machines to move individual atoms—an IBM research group wrote "IBM" on a nickel crystal with 35 precisely placed xenon atoms. As these abilities develop, they can be used to build better molecular tools, and these to build still better tools, accelerating progress toward molecular manufacturing and a broad range of applications.

In Japan, the Ministry of International Trade and Industry has announced a 10-year project to develop atomic- and molecular-level manipulation technologies, aimed at learning to build with individual molecules. At its center is a consortium of 46 companies that will be seeded with \$200 million in government funds. It is time for the United States to join in a serious program along these lines. In the short term the payoffs will be substantial, and in the long term the foundations of our industrial civilization could be transformed.

K. ERIC DREXLER  
Chairman  
Foresight Institute  
Palo Alto, Calif.

### COLLABORATIVE LEARNING

Edward Barrett's grasp of the importance of collaboration in learning to write is exceptional ("*Collaboration in the Electronic Classroom*," *TR February/March 1993*). One aspect of his work that distinguishes it from similar educational experiments is its tendency



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## LETTERS



to combine electronic collaboration with the ordinary face-to-face kind. Computer-aided collaborative learning is likely to be most effective if students are also engaged in nontechnological interactions such as group work, peer evaluation, and peer tutoring. These are not just something to turn to when the system is down: they enhance technologically mediated collaborative learning because they are more direct and warm-blooded. They are also more efficient: they require no maintenance, no special equipment, and no capital investment.

But Mr. Barrett might want to reconsider his claim that he and his students become collaborators. Students can really collaborate only with their peers. To regard teachers and students as collaborators masks the unavoidable power imbalance between them. Teachers organize collaborative learning, whereas students (normally) do what teachers ask them to do. Mr. Barrett yields to a temptation many of us feel—confusing peership with apprenticeship.

Fortunately, however, the test of software designed for collaborative learning is not whether it subverts the inevitable social asymmetries between teacher and student. The test is whether it empowers students—whether it helps them learn the skill of interdependence among themselves. That Mr. Barrett's program seems to do very well indeed.

KENNETH A. BRUFFEE

Director

The Scholars Program  
 City University of New York

## RISKS FROM LOW-LEVEL RADIATION

In "Radiation Risks Revisited" (*TR February/March 1993*), Len Ackland has plunged into quicksand where even angels fear to tread. But in the process, he has brought to the controversy surrounding low-level radiation the kind of balanced

treatment that is often woefully lacking.

The issue of low-level radiation reminds us how frequently human health and the environment are found near the bottom of the hierarchy of society's values. In most of the industrialized world, the preoccupation has been production, not health, and now nations are confronted with the insoluble problem of how to handle the radioactive waste from power and military reactors, as well as the plutonium and highly enriched uranium from dismantled weapons.

Records that could shed light on the health effects of radiation are frequently kept under wraps. But now, at long last, some of them are becoming available. In an area south of Leipzig, hundreds of thousands of workers in uranium mining and processing centers were exposed to low-level radiation for decades. Thorough medical records on 450,000 of these workers were maintained in secrecy until 1989, when the East German regime collapsed. This treasure trove of information on cancer and other illnesses has been retrieved and is now being computerized with an eye to continuing follow-up on as many exposed individuals as possible. There are also records on workers in our own weapons complex, and on thousands of people in Chalyabinsk, in the former Soviet Union, who drank water grossly contaminated by radioactive sludge.

Taken together, these data may provide a critical mass of epidemiologic information that could resolve much of the controversy over low-level radiation. But until then, we would do well to respect the approach of the American Medical Association's advisory panel on the matter: "While controversy exists, the present conservative assumption is that any dose of radiation has a deleterious effect even if it cannot be identified."

HERBERT L. ABRAMS

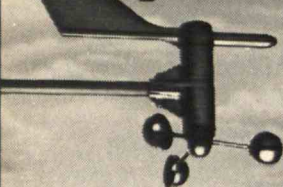
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*Editor's note: For more on the database in former East Germany, see the Trend "A Treasure Trove of Data" by Seth Shulman in the February/March issue.*



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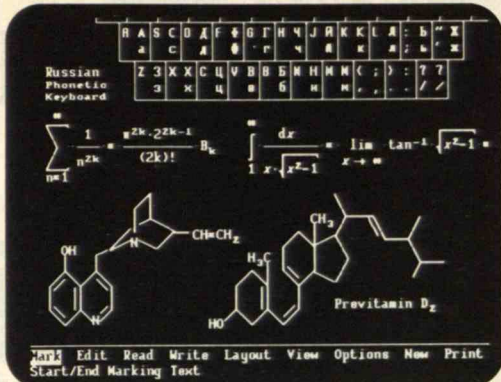
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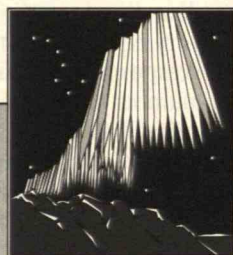
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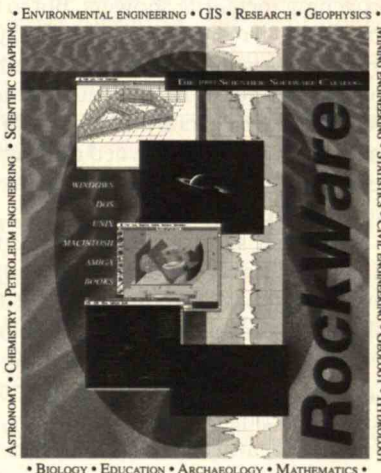


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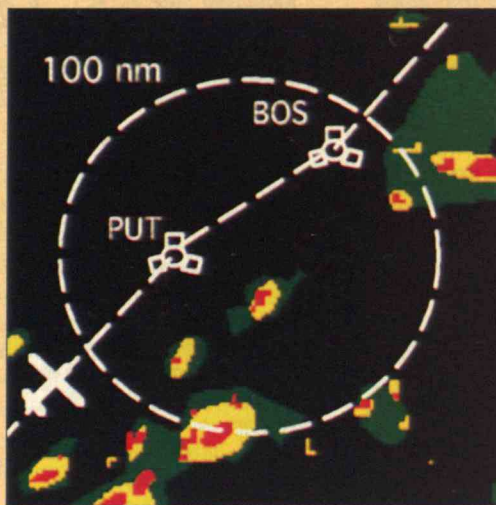
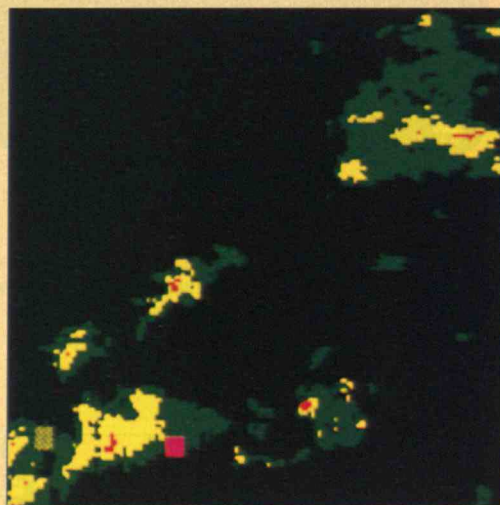
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# MIT Reporter



*To send weather information to pilots in one scan, Lincoln Laboratory researchers have developed software that compresses information provided by commercial radar maps (far left). The shapes of the weather regions posing the most danger are the least distorted (near left, shown in red).*

## BETTER WEATHER MAPS UP IN THE AIR

 Buck Rogers had flashing gizmos to warn his spacecraft of approaching meteorite showers. But in this computer-driven age, most airplanes plying the lower levels of earth's atmosphere have yet to receive much simpler weather alerts. Once aloft, most pilots have to rely on overcrowded radio channels to get only brief verbal sketches of weather conditions.

"I can get significantly better information on hazardous storms sitting in my hotel room watching the Weather Channel" than in the cockpit, says R. John Hansman, MIT director of the Aeronautical Systems Lab. In the future his complaint may be stilled by the Graphic Weather Service (GWS), a system that compresses weather map images and beams them as digital data from ground to plane, where they are reprocessed into pictures that appear on computer screens. The first airborne tests of the set-up, developed by a team headed by Raymond LaFrey, leader of the Air Traffic Surveillance Group at MIT's Lincoln Laboratory, should be completed by August.

The images will be one of the services offered to pilots who have a data link

to a radar system known as Mode S, scheduled to start up by 1995, which will send electronic data between planes and ground control for the purpose of improving safety. Each time Mode S radar pulses scan a plane that is outfitted with complementary equipment, it will automatically respond with a unique identification number and information on its altitude. The system should eliminate a problem that commonly occurs when simultaneous radar responses garble information delivered to ground control.

One reason for adding the weather-information service to the Mode S system is to tempt more general-aviation and small-commuter plane pilots (operating craft that can carry up to 30 passengers) to invest in the new equipment. While federal regulations require larger commercial planes to be outfitted with the system by this year's end, the Federal Aviation Authority has withdrawn a plan to demand the same of small airplanes after pilots complained about having to buy equipment for a system not yet operating.

Another data-link service that the Lincoln Lab researchers are developing for the Mode S system involves cockpit displays that alert pilots to nearby air traffic. The lab is also work-

ing on a computer-assisted navigational aid that will deliver complex sets of latitude and longitude points to route planes more directly, thus saving time and fuel.

A major concern in designing these services is the amount of computer power they use. A short message, such as one transmitting altitude and identification, requires only 56 computer bits—an easy task for the Mode S radar, which can send 1,280 bits per scan. But the delivery of, say, a standard weather-map image ordinarily requires so many bits that the Mode S radar would have to scan a plane more than 100 times over seven-and-a-half minutes, by which time much of the information would likely be obsolete. The Lincoln Lab team has therefore developed software that compresses information so that an image can be sent in a single scan.

The information is compressed from commercial weather radar maps. These maps grade each weather region—called a blob—with a number ranging from 0 for clear skies to 6 for high turbulence and heavy rain, snow, or hail.

Initially the software copies the blobs' exact shapes. Then, because general-aviation pilots avoid weather regions higher than level 2, the Lincoln Lab software saves space by combining the



shapes of levels 3 to 6. Next it simplifies the shapes of most regions into polygons or ellipses so that they can be depicted with fewer bits. As the program takes a series of successive "cuts" at the map, constraints on the allowable distortion of weather regions ease up. Parameters are set so that the areas with the highest weather levels, which pose the most danger, are the least distorted. Trimming the number of edges of some polygons and replacing others with ellipses further eliminate bits. The compression continues until a map requiring no more than 1,280 bits is formed. Reprocessed on the plane, the map appears on a computer screen in green, yellow, and red as a flattened, less detailed version of the original.

### Complex Decision Making


Using simulated cockpits and 20 experienced pilots, the researchers are evaluating the effects of weather graphics on decision making. "We may find out that pilots want higher fidelity," says LaFrey. If so, the amount of compression could be reduced and the data sent in two radar scans, requiring roughly nine seconds.

Whether offerings such as GWS will persuade general-aviation pilots to switch to Mode S radar depends both on economics and ergonomics. So far, says Steven Brown, senior vice-president of the Aircraft Owners and Pilots Association, member surveys show a willingness to pay up to \$3,000 for the system, but it is likely to cost \$5,000 per plane. Moreover, pilots who fly solo and have to juggle many tasks at once may be reluctant to add one more to their list.

Meanwhile, GWS has stirred interest among commercial pilots, says LaFrey, despite the fact that many have on-board access to another weather radar system. The typical range of such a system is 100 to 150 nautical miles straight ahead, and sightlines are blocked below, beside, and behind a plane. GWS would deliver weather maps of any area en route to a plane's final destination.

—FRANCESCA COLTRERA

## GETTING A FIX ON NITROGEN CONVERSION

 The lowly pea puts the chemical industry to shame. While chemical engineers require extremely high pressures and temperatures to break apart the stable atmospheric nitrogen molecule to produce ammonia, the pea and other legumes, working in symbiotic relationships with bacteria, can accomplish the feat at room temperature and atmospheric pressure.

The economics of agriculture and the chemical industry would be radically altered if chemical engineers could copy the feats of the legumes. The industrial production of ammonia alone—used in fertilizer, plastics, explosives, dyes, and other compounds—is worth at least \$11 billion a year.

William Orme-Johnson, an MIT professor of chemistry, is a leader in the search to uncover the secrets of nitrogenase, the enzyme responsible for legumes' ability to "fix" atmospheric nitrogen molecules. Nitrogenase somehow grabs and bonds to the normally inert nitrogen molecule and then breaks it up.

In 1972, Orme-Johnson showed that one of the two proteins in nitrogenase, the molybdenum-iron protein, was probably responsible for the grabbing activity. In 1974, University of Wisconsin researchers discovered further that a molecule called a cofactor was attached to the protein and actively engaged in grabbing the nitrogen molecule. The mystery was how: the scientists figured out that the cofactor contained iron, molybdenum, and sulfur, but none of these elements usually reacts with atmospheric nitrogen at room temperature and atmospheric pressure.

In 1989, Orme-Johnson's group developed a technique to cleanly isolate the cofactor, enabling researchers to examine it closely. Starting with a batch of nitrogenase, Orme-Johnson's group first added a cellulose derivative that adhered to the enzyme. Then the chemists passed a solvent through the

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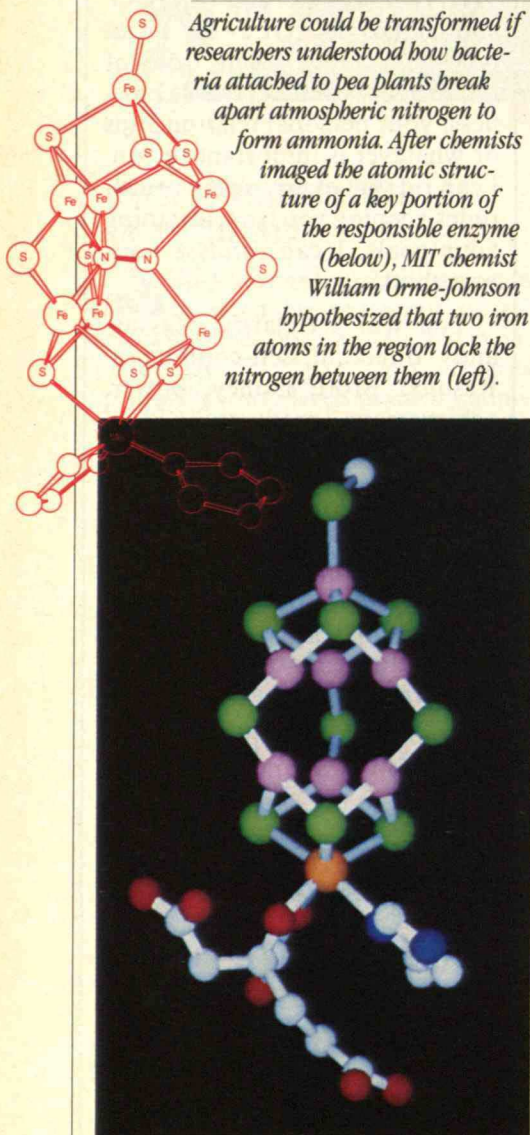
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cellulose, which drove off the water that normally surrounds enzymes. The balled-up enzyme responded by unfolding and making the cofactor accessible. The team then added a strong salt that separated the cofactor from the rest of the enzyme.

At that point, Orme-Johnson used an array of spectroscopic techniques—which entail exciting a sample with electromagnetic radiation and examining the response—to determine the kinds and number of atoms present in the cofactor.

*Agriculture could be transformed if researchers understood how bacteria attached to pea plants break apart atmospheric nitrogen to form ammonia. After chemists imaged the atomic structure of a key portion of the responsible enzyme (below), MIT chemist William Orme-Johnson hypothesized that two iron atoms in the region lock the nitrogen between them (left).*

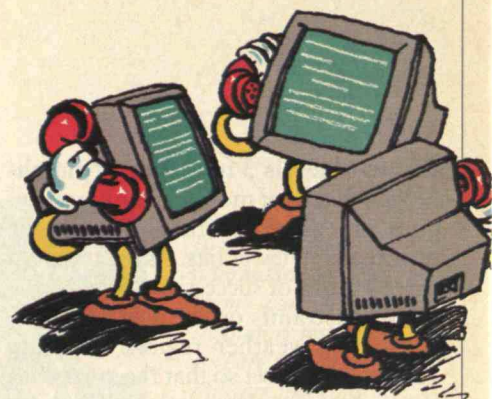


Then, last summer, chemists at the California Institute of Technology and Purdue University crystallized nitrogenase and developed fairly clear images of the cofactor's atomic arrangement. Because protein crystallography provides two-dimensional pictures of the relative positions of atoms but does not identify them, Orme-Johnson's results were crucial for interpreting the images. The Caltech/Purdue images suggested that Orme-Johnson's list for various atoms in the cofactor is accurate.


Orme-Johnson then hypothesized where the atmospheric nitrogen molecule should fit in the cofactor structure. He proposes that two of the cofactor's iron atoms can lock atmospheric nitrogen between them in a vise grip. Many of Orme-Johnson's colleagues consider this idea a breakthrough because most chemists had previously hypothesized that the cofactor's molybdenum atom probably grabs the nitrogen. Also, the iron atoms contradict normal chemistry rules: each is bound to three other atoms when it would usually bind to four. Orme-Johnson has not yet developed a complete hypothesis to explain the unusual bonding pattern.

Orme-Johnson is now trying to add a new step to his cofactor-isolation technique: crystallizing the separated cofactor. He hopes that crystallographers will be able to develop a cleaner image of that structure than is available with the protein, whose other parts can partly hide some of the ion's structure. He's also trying to decipher just how nitrogenase marshalls the energy needed to break up the atmospheric nitrogen molecule. And he's studying the genetics regulating the cofactor's manufacture, which could eventually allow biologists to engineer non-leguminous plants so that they, too, can fix nitrogen.

Orme-Johnson thinks that this would be the most important result: "If we can understand the enzyme's structures and the functions of the genes that specify nitrogen fixation, we may be able to create plants that would free the world from its dependence on ammonia fertilizers." —LESLIE BRUNETTA



## HAVE COMPUTER, WON'T TRAVEL

 Researchers have long relied on scientific meetings—at least 10,000 are held every year in the United States alone—to keep up in their fields. But a new application of computer networking, based on a popular variety of electronic gathering places known as MUDs (for multi-user dimension or multi-user dungeon), may allow scientists to collaborate without leaving the comfort of their workplaces so often.

Amy Bruckman, an MIT Media Lab graduate student, and Mitchel Resnick, an assistant professor of media arts and sciences, have developed what may be the first such system dedicated to work-related communication rather than gaming. Hundreds of researchers from a dozen countries have entered the system since it threw open its silicon gates early this year.

Bruckman and Resnick's system, tailored for use by media researchers, provides a simulated environment—a set of imaginary rooms—in which any number of participants can exchange type-written messages with virtually no delay. Researchers connecting to the system through Internet, the worldwide network used by universities, government, and industry, can gather in a simulated auditorium to conduct the kind of business, except for visual presentations, that normally occurs at a professional seminar. Smaller groups can move to a quiet "conference room" to share ideas about a joint project or gather for spontaneous gossip sessions in a simulated hallway.

Devised in the late 1980s by Xerox researcher Pavel Curtis, the MIT system's programming language does not require users to have much specialized



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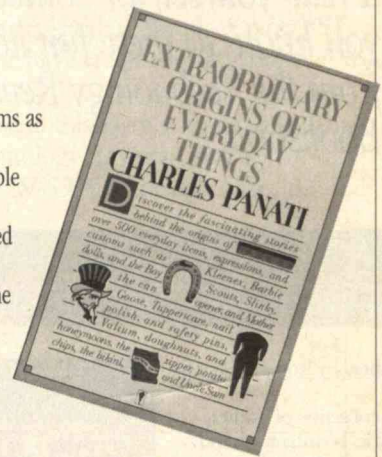
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knowledge before they can communicate and move among various rooms. For example, when users first enter Bruckman and Resnick's system and type the command "look," a message appears on the screen explaining that they are in the E&L Garden (named after an actual room in the Media Lab), which contains various objects such as posters and papers and has exits in several directions. Participants can move among rooms by typing commands such as "north" or "south." If someone named Jill types: "say I need some help with this subroutine," everyone else in the same "room" then sees: "Jill says, 'I need some help with this subroutine.'"

### Customizing the System

The system also allows users to add new rooms or objects to the virtual environment, such as personal bulletin boards where messages can be posted and read, merely by copying existing rooms and objects. Users customize these bulletin boards by devising new functions or editing their descriptions, which automatically appear when someone enters a "room" or looks at an "object."

Lacking sound and images, Bruckman and Resnick's system does not transmit as much information per unit of time as other interactive media such as telephone and video conferencing. But the network links users economically and efficiently. And because the system has what David Steffen—an associate professor at Baylor College of Medicine who is developing a similar system for bioscience researchers—calls "a playful atmosphere," it encourages informal discussions resembling real talk.

Users say that Bruckman and Resnick's system has been helpful. Barry Hayes, a Stanford University graduate student knowledgeable about managing computer memory, used it to give an impromptu tutorial to a desperate colleague. Nils McCarthy, a computer-science student at the University of Minnesota, persuaded someone he met through the system to give him a job in software development.—WADE ROUSH

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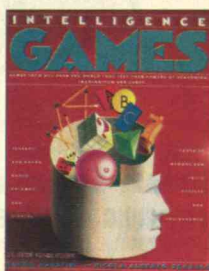
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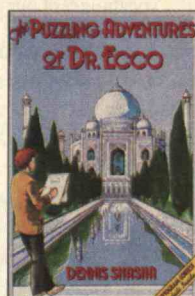


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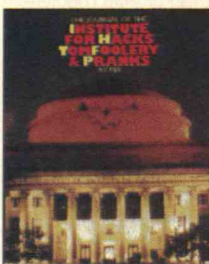


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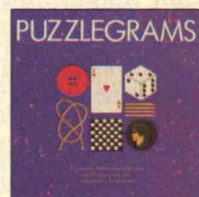


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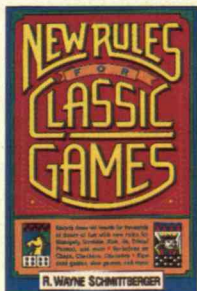


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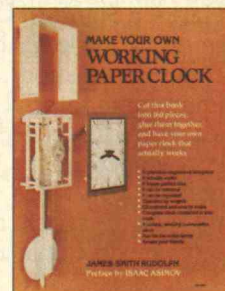


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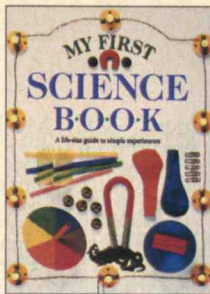


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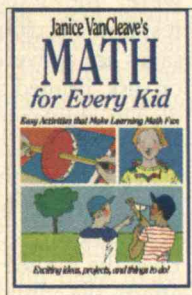
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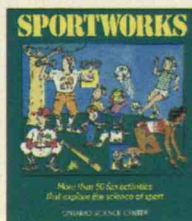
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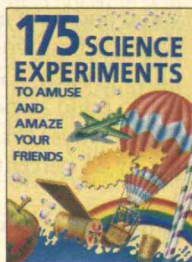


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# Trends



## Sending a Message to the White House

When Bill Clinton went to work in the White House this past January, he was appalled by its state of technological backwardness. Not only did the offices feature few personal computers and no electronic mail, but anyone picking up the same telephone line as the president could eavesdrop.

George Bush, like many executives of his generation, was unfamiliar with the marvels of the personal computer revolution, and the office he left to his successor reflected that style. Clinton, on the other hand, not only ran as a "high-tech" candidate but also introduced computer technologies to the presidential campaign that now promise to change the way the White House does business.

For example, Clinton was the only candidate to tap into the power of computer networks to get out his message. Using CompuServe, a popular computer network, the campaign staff in Little Rock distributed copies of Clinton's speeches, press releases, white papers, and schedules. They also responded to electronic messages sent by those using any computer network with a "gateway" to CompuServe.

*In keeping with the president's penchant for high technology, the White House has recently opened lines of communication to anyone with access to a computer network.*

The Clinton administration recently confirmed this interest in computer networks when it hired Jock Gill—a network maven who managed Clinton's e-mail during the campaign—as director of public access, e-mail, and electronic publishing, a new post in the White House Office of Communications.

Since Gill's appointment, the administration has been doing a great deal of electronic outreach. Connections to the White House are now available on CompuServe, America Online, MCI Mail, Prodigy, and the Internet. The universe of people connected to these services is more than 13 million.

Computer networks are now carrying daily White House releases, including press statements, summaries of Clinton proposals, the full text of speeches and position papers, and even announcements of government appointments, complete with biographies.

Computer network users can also send e-mail to the White House. On CompuServe, the command "Go White House" prepares a message for the pres-

ident. MCI Mail offers the "VIEW WHITE HOUSE" option, and on America Online users can send mail to "Clinton Pz." Prodigy has a "Write to Washington" feature, and Internet's address is 75300.3115@CompuServe.COM.

The White House currently receives about 800 e-mail messages per day that cover a wide range of issues and opinions, says Gill. But, because of a shortage of computers and communications software, the Executive Office cannot respond electronically. Electronic messages are delivered to the White House on disk, printed on paper, and then handled as regular mail by correspondence officials. E-mail correspondents are even asked to send their postal addresses if they want a reply.

Eventually, say both Gill and Jeffrey Eller, the White House director of media affairs, the administration wants to have the capability to respond to e-mail over computer networks, as well as route mail electronically to the most appropriate recipient in the executive branch. "A lot of people think that because we're the White House we can wave a magic wand and have a state-of-the-art system with the best workstations and a roomful of people," Gill says. "But we're trying to build something in the midst of a White House that is trying to cut spending by 25 percent."

### Automated Mail Delivery

To deal more effectively with a high volume of electronic mail—an amount that Gill predicts could eventually jump to tens of thousands of messages per day as more people go online—the White House has called on a group of researchers from MIT's Artificial Intelligence Laboratory to develop a computer program that will analyze the content of a message and forward it to the appropriate department. The researchers propose that each message sent to the White House should comply with a standard electronic form that would request the user's name and address as well as more specific information, such as whether the



sender is writing as the representative of an organization or requesting copies of pertinent government publications.

Once a formatted message is received, a program would analyze responses to specific questions, search the text for key words, and route the message accordingly. For example, repeated mention of "Bosnia" might automatically forward the message to the State Department.

This seemingly simple plan presents several thorny technical challenges. Most important among them is the assortment of incompatible transmission standards and protocols required by the various networks. Translation programs would be needed to automatically format text regardless of its source so that it could be sent over any given network. Also, because e-mail messages can be segmented easily, with parts routed separately, guidelines would have to be drawn up to ensure that a message does not become something other than what the sender intended it to be.

Finally, notes Eric Loeb, an MIT team member, if the Clinton-Gore plan for rewiring the nation with high-bandwidth fiber optic cable takes effect, people will be sending the White House not just text and telephone messages, but video and graphics as well, making information management an even bigger challenge.

Despite these challenges, Gill is bolstered by the fact that other organizations have dealt with many of these nagging technical issues, albeit on a smaller scale. He also believes that the administration will make this project a priority since "connecting the government and the people" is one of its tenets. "If the White House can learn what citizens want and can process the information more intelligently and more interactively," he says, "everyone wins."

Gill wants to make the Clinton administration the first to routinely include e-mail addresses on its business cards. Just as telephone calls to the White House are considered a fundamental part of American democracy, he hopes that computer messages will someday be just as common.

—GARY CHAPMAN

## The Sound of Data

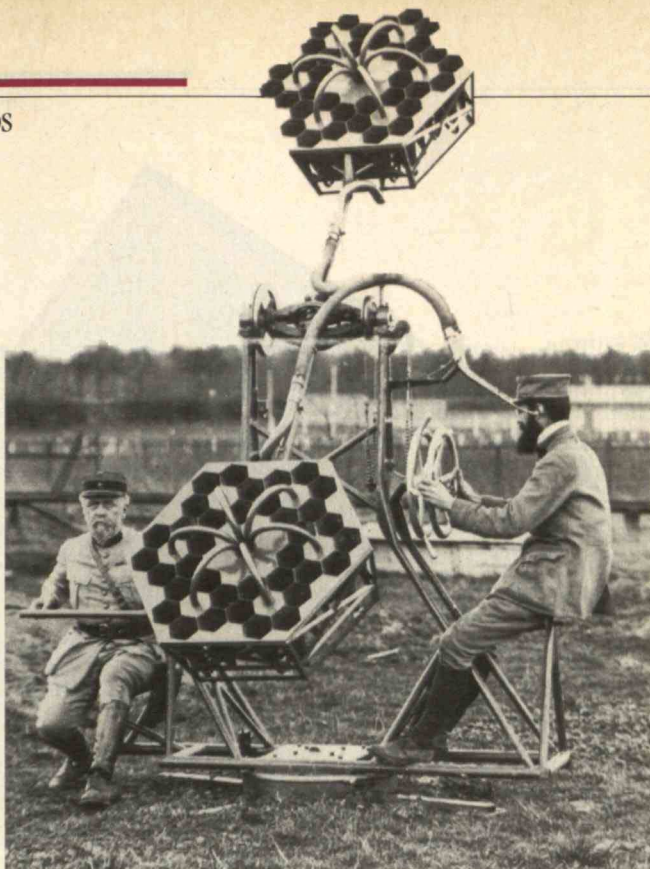
Our ability to interpret sound is at the heart of a new technique for communicating information called virtual acoustics. Essentially, virtual acoustics can do for the ears what virtual reality does for the eyes. When you play a virtual-reality game, you wear a helmet with a video screen for a visor. The screen makes enemy aliens appear as if they are in the same room, leaping toward you, darting into and out of your peripheral vision. Your brain perceives the action as taking place all around you.

With a virtual acoustics system, researchers construct an auditory environment for a person wearing a pair of headphones. It can place sounds anywhere in the three-dimensional space around a person: directly overhead, behind the back, off to the right, and so on.

### Virtual Applications

The virtual acoustic effect is somewhat like that generated by so-called surround-sound systems in movie theaters; if speakers are placed all around the room and the soundtrack is timed to play through them sequentially, a motorcycle rushing past a pedestrian actually sounds like it is coming toward and past the audience. But such effects are preprogrammed, and the systems can move sound only in a horizontal plane. A virtual acoustics system, in contrast, operates in real time, is interactive (the signals change as conditions change), is fully three-dimensional, and works through simple headphones, not a raft of speakers.

Though the technology is still in the



*Whereas the pseudophone enhanced the listener's ability to locate enemy aircraft during World War I, today's acoustic devices simulate sound for air-traffic control, telepresence, and virtual-reality applications.*

experimental stage, and thus may now be used only to enhance virtual-reality games, its creators have much broader applications in mind. For example, Elizabeth Wenzel of the NASA Ames Research Center at Moffett Field, Calif., and Scott Foster, founder of Crystal River Engineering in Groveland, Calif., are working on a prototype system that they hope someday might be refined to help air-traffic controllers direct planes more accurately. If a controller were simultaneously talking to three pilots, two in front of the tower at 10 o'clock and 2 o'clock and one directly behind the tower at 6 o'clock, a virtual acoustic system could spatially separate the conversations. A controller wearing headphones would hear each pilot's voice as if it were coming from the direction of each plane.

Such a system conceivably could provide other auditory cues. A low-frequency tone beating from the direction of each plane could quicken as the aircraft approached the airport, helping the controller gauge distances. A high-pitched alarm could sound if the planes



at 10 o'clock and 2 o'clock began to drift too close to each other as they prepared for parallel landings.

Teleconferencing is another potential application, says Foster. Participants would hear each person's voice as if it were coming from a distinct seat around an imaginary table, enabling the listeners to hear several people speaking at once. In today's phone-conferencing systems, each person must patiently wait for a turn; if two or more people speak at once, their voices collide in the earpiece, making it impossible to discern who is saying what.

Wenzel and Foster also envision systems that could help operators guide robots into hazardous areas. Instead of just seeing what the robot sees, they could hear what the robot hears, making them feel as if they were standing in the same spot. This could help sense the location of a trickle of water from above, for example, or a gas leak from behind. The researchers say virtual acoustics could also greatly enhance the budding field of architectural acoustics—the science of simulating how a new concert hall, meeting room, or auto interior will sound before it is built.

Another potential application, being developed by Jack Loomis of the University of California in Santa Barbara, would act as a navigation aid for the blind, sending out sonar-like waves that would reflect off objects and feed back auditory signals indicating the position of surrounding objects and their distances.

### Perceptual Peculiarities

Stuart Smith of the University of Massachusetts in Lowell is focusing on a technique called data sonification, which adds sound to computer-aided data visualizations. Computers are often used to help analysts visualize information by plotting three dimensions of data on a graph and

using color and symbols to represent a few more variables. Adding sound could allow the system to represent additional variables or accentuate data that are already graphically represented.

Designing a virtual acoustics system is largely a computational effort. In air-traffic control, for example, algorithms in a central processor track the various voices

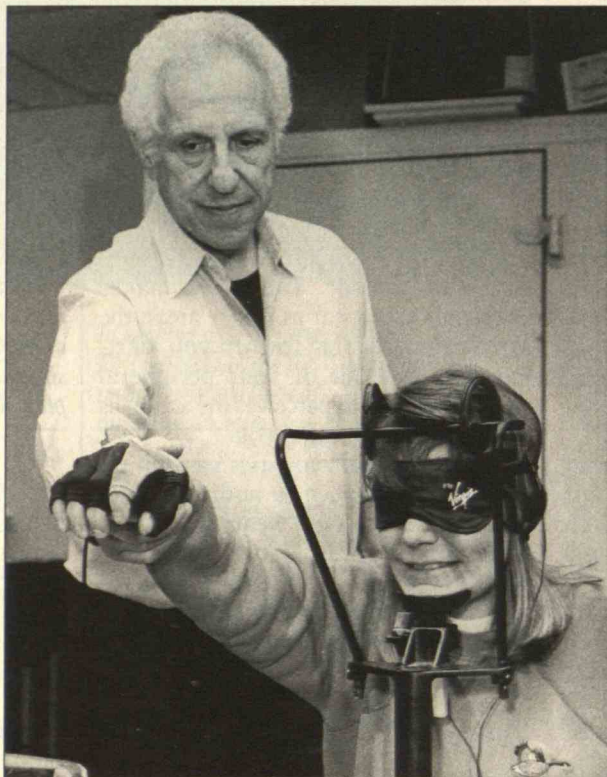
incoming sound-wave signals simultaneously and send out the appropriate impulses. His company has sold 30 Convolvotrons to universities and labs that are conducting further research into virtual acoustics and to virtual reality firms developing simple commercial applications, such as the system in use at Star Tours, a new simulator ride at Disneyland.

Before more serious commercial virtual acoustics programs become reality, researchers must learn more about certain anomalies in the way the brain processes sound. For example, when testing how subjects perceive sound in three dimensions, Wenzel and Foster noted two unusual effects. In the first, called front-to-back reversals, the brain perceives a sound as lying in a plane in front of the head at one moment, then behind it the next, even though the source hasn't moved. The brain also tends to misjudge the elevation of a sound coming from some directions by as much as 15 degrees.

These perceptual peculiarities usually don't cause problems because we automatically compensate for them by using other senses or simply turning our head to hear a sound from a different angle. But they could wreak havoc on air-traffic control or other virtual acoustic simulations that involve only sound.

To try to understand why these aberrations occur, Wenzel, Foster, and others, including a group at MIT's Research Laboratory of Electronics, are using the Convolvotron to systematically test to what extent people perceive sound differently as well as the factors that contribute to the differences. Once they have a more complete understanding of how the brain processes sound, they can write algorithms that will negate the anomalies, enabling listeners to interpret sound accurately and unambiguously.

—MARK FISCHETTI



*Researchers experiment with the Convolvotron, a device that presents simulated sounds in three dimensions, to compensate for human limitations in pinpointing sound sources.*

and direct the processor to modulate the sound impulses sent to the headphones so that the voices and signals are heard in the proper spatial position.

"Because this processing is so complex, these systems can be software nightmares," says Foster. To deal with the complexity, he designed the Convolvotron, a real-time digital signal processor that can handle up to four



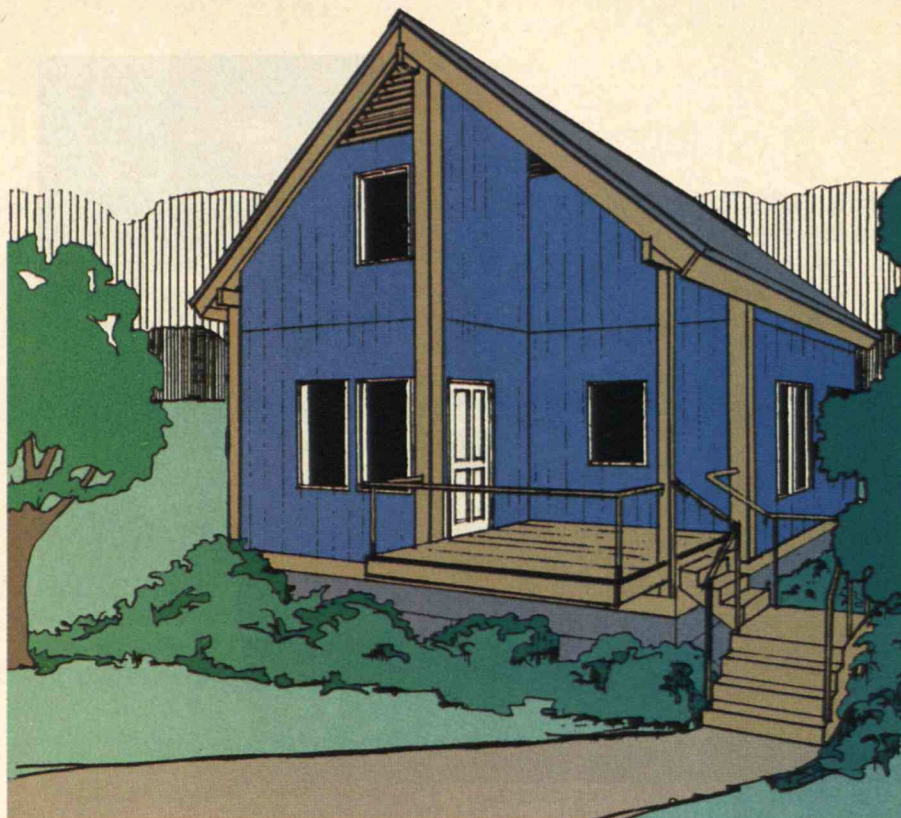
## Now You *Can* Take It with You

Many of us who have attempted to enter the housing market suffer from the "Goldilocks" syndrome: this one's too small, this one's too big. Now researchers at the Rensselaer Polytechnic Institute are trying to develop technology that will make a house just right—an "erector-set" home that you can change, add to, and even take with you.

The new housing—called the Home Erector System (HES)—was designed to be assembled from small pieces weighing no more than 100 pounds, says designer Walter Kroner, director of RPI's Center for Architectural Research. "And if you're willing to work and can use a screwdriver, hammer, and an electric drill, you and your friends can build this house yourselves." The only items that don't arrive in the kit are the water, sewer, and electrical lines, which must be attached from the street to the house by outside contractors.

Kroner believes that the do-it-yourself house will cost 40 percent less to build than other modular style houses of similar quality and size. For example, he claims that a 1,400 square-foot, single-family unit with 3 bedrooms and 1-1/2 baths will cost approximately \$40,000, excluding land.

The biggest difference between an HES home and other types of modular housing is that its pieces are fastened with screws, bolts, and clamps instead of nails and permanent adhesives. Thus it can be completely disassembled or, less dramatically, expanded or reduced in size to keep up with the needs of a family, as its income, lifestyle, and preferences change over the years. "No longer will you have to finance and build a house that's bigger than you need at the moment for fear you'll be stuck with something too small," says Kroner. "Later on, when the kids are grown, you may want to disassemble your house—or part of it—to make it smaller or move it to the lake and retire."



### Some Assembly Required

To prove the feasibility of the concept, a group of seven RPI architecture students with no previous building experience recently assembled a 1,400-square-foot single-family prototype HES. (All of the prefabricated pieces in the system were constructed by RPI researchers from off-the-shelf materials available from most building supply stores.)

Following the HES instructions, the students first laid the foundation. Using a rented hand-held auger, they dug 14 evenly spaced 2-foot-diameter holes for the concrete foundation to a depth of 5 feet (1 foot below the frost line in Troy, New York) to prevent frost heaves. They then placed large cardboard tubes into the holes, leveled them, and filled them with cement to form the cylindrical foundation piers. After the cement hardened, the workers drilled a hole into the center of each pier so that a large bolt—to which a support post would be attached—could be inserted and then secured by epoxy filler.

To construct the structural frame, the students assembled wooden post and beam segments and fastened them to the bolts in the foundation piers. They then

*This prototype do-it-yourself home—a 1,400-square-foot, 3-bedroom model—can be built from prefabricated parts by two or three unskilled workers for about \$40,000, nearly half the cost of similar modular homes.*

dropped in prefabricated flooring and ceiling panels between the beams and, working in the 3-foot crawl space beneath the structure, attached prefabricated insulation panels covered with weatherproof fiberglass to the underside of the flooring.

The students then screwed on insulated exterior wall panels with sheathing to which vinyl, cedar, or other siding materials could be attached. And to complete the structure, they clamped together interlocking metal roof panels and screwed them to the roof rafters.

Interior components were also designed for easy assembly and disassembly. Drywall sections were screwed into place to form the inside walls. Prefab cabinets, sinks, toilets, bathtubs, and showers were bolted into place. And the plumbing pipes, electrical wiring, and heating and air conditioning components were all fitted together with screw or plug fasteners rather than with solder





*Because all components are assembled with bolts, screws, and clamps instead of nails and glues, this house can be expanded or reduced in size or completely disassembled and moved.*

or other more permanent connections. Instead of placing utility pipes, cables, and hoses inside the walls, the students ran them through the house from the central utility room in raceways—6-inch-wide by 2-inch-deep metal troughs mounted to the ceiling or the base of a wall—that would enable easy access for disassembly and repairs.

### Reaching a Wider Market

The house meets New York State building codes and earthquake requirements and, in some cases, exceeds them. For example, because the plans for a one-story home allow for the addition of a second story if desired, the researchers specified 6-by-6-inch wood columns as opposed to the 4-by-4-inch columns normally required for conventional one-story construction.

Kroner has begun forming a council of manufacturers, builders, suppliers, bankers, real-estate agents, and other representatives from the housing industry to provide venture capital for com-

mercializing the idea as well as offer guidance on how to improve the design and components. So far, council members have mainly criticized the unit's appearance. For example, J. David Michaels, president of the Michaels Group, an independent real-estate developer, finds that the structure looks too much like a cabin because it doesn't have a

basement and rests on posts, which look like stilts. He recommends adding some type of "skirting" around the base of the house to conceal the stilts and crawl space. Other advisers would like to see a larger variety of models and more cosmetic details such as bay windows and other types of siding.

"We could include a basement or add any number of options—for a price," Kroner says. "We're just trying to keep costs to a minimum to make home ownership a reality for middle-income families."

Members of the construction trades have voiced concern that skilled builders and contractors will lose jobs because the houses can be built with inexperienced workers. But at least one industry representative, Robert Wieboldt, executive vice-president of the New York State Builders Association, maintains that tradespeople should welcome the new style of construction, pointing out that "if the non-professional can build it, the professional can build it better and more quickly." This kind of housing, he says, will enable all those in the industry—builders, contractors, developers, and building-product manufacturers—to reach a wider market.

—PATRICIA BARNES-SVARNEY

## High-Tech Scarecrows

At New York's John F. Kennedy Airport, airplanes and birds are locked in a violent struggle. In 1975, a DC-10 jet engine ingested a few stray sea gulls and, seconds after 139 passengers escaped, exploded into flames. In May 1991, a packed B-747 carrying 365 passengers screeched to a halt after striking a flock of gulls, blowing out 10 tires and overheating the aircraft's brakes.

Such collisions have become so frequent at JFK—birds have destroyed some 40 jet engines since 1979—that officials have designed a drastic program to reduce the danger: kill the birds before they kill us. Over the past two summers a team from the U.S. Department of Agriculture's Animal Damage Control Program was contracted by the Port Authority of New York and New Jersey to gun down some 27,000 laughing sea gulls inhabiting the protected Jamaica Bay Wildlife Refuge near the airport.

This rather brutal method has drawn protests from animal rights activists, who advocate using more humane approaches. For example, D.J. Schubert, a wildlife biologist with the Fund for Animals, says fields of grass left to grow wild around the airfield could prove disagreeable to gulls, who prefer short-cropped grasses and open spaces so they can keep the rest of their flock in sight at all times. He also suggests repairing runway potholes that become inviting bird baths after rain storms and fining taxi drivers who serve up leftover lunches to the birds.

### Innovative Options

More aggressive (though still nonlethal) methods can also succeed. Many airports scare away birds by setting off harmless compressed-gas explosions from cannons stationed around runways. Others deploy artificial bird carcasses near runways, a grim warning that frightens off members of the same species. At Pierson Airport in Toronto, falconers dispatch trained hawks into the skies to chase away flocking birds.



And the Israeli Air Force invites volunteer birdwatchers equipped with binoculars to monitor the flight paths of migrating European storks. When a flock comes into view, the pilots are alerted and directed out of harm's way.

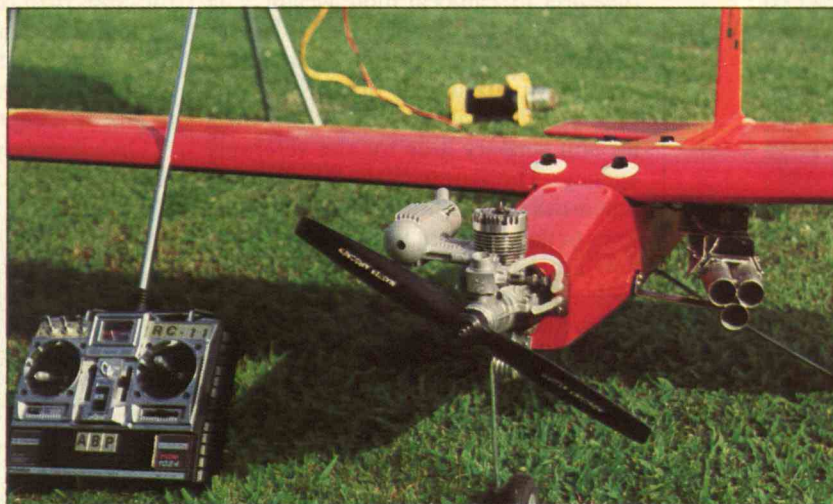
Attempts to redesign aircraft to withstand bird strikes have been largely unsuccessful. Jet engines are great open sucking machines that will swallow anything in their path: birds, tools, and on one occasion at JFK, a lawn mower. Aerospace engineers at the Federal Aviation Authority recently tested the vulnerability of various engine designs by firing thawed chickens and bags of gelatinous materials into rapidly spinning rotors. The engineers concluded that turbine blades heavy enough to withstand bird strikes would negate attempts to design lighter, more fuel-efficient engines. They also decided that placing a protective screen on the front of each engine, another obvious measure, would inhibit the thrust required to lift a plane off the runway and might itself be drawn into the rotors.

Other technological solutions, such as electronic devices that explode, holler, and screech at irregular intervals can drive birds away from aircraft flight paths. For example, the U.S. Air Force deploys loudspeakers around runways to blare out the distress signals of offending flocks or reproduce the cries of birds of prey. It also launches remote-controlled boats to make noise and chase birds from nearby ponds, and even dispatches snipers with shotguns to fire blanks at bird flocks.

Perhaps the most elaborate bird-chasing apparatus is the brainchild of Michael Amir, a former Israeli Air Force pilot and model airplane enthusiast, who built a remote-controlled airplane with three-foot



*Bird chasers: Trained hawks (top) have proven adept at frightening other birds away from airports, as have cannons (above) that produce harmless gas explosions. The most technologically sophisticated solution is a remote-controlled model plane (below) that fires pyrotechnic shells at wayward flocks.*



wings carrying barrels that fire harmless pyrotechnic shells. Amir altered the muffler to make the engine noisier and painted the plane bright red on the advice of an Israeli ornithologist who discovered that the color unnerves sea gulls.

Amir's model airplane has been used at Ben Gurion International Airport in Tel-Aviv to disperse the storks and Caspian gulls that forage for food at a nearby municipal garbage dump. According to airport officials, the craft has succeeded in reducing the resident bird population from 90,000 to as few as 10,000 during the peak season.

The winged pyrotechnic machine did make an impressive trial debut at JFK in 1989, bombing the airport perimeter with noisy charges and frightening gulls from their nesting centers, says Jack Gartner, the airport's director of operations. But it was abandoned because, unlike airport officials in Tel-Aviv, Gartner was unwilling to pay for running the plane on an almost continuous basis, which would include allocating resources to controlling and tracking the swooping plane carefully enough to avoid confusing pilots or air-traffic technicians.

Although Gartner maintains that bird shooting is the most foolproof, cost-effective, and humane option currently available to protect the flying public, New York's laughing gulls are safe, at

least for the moment. The Fund for Animals along with other animal rights advocates recently filed suit against the Port Authority to ban bird sniping. In the settlement, Port Authority officials agreed to conduct an environmental impact study and explore alternative approaches to bird management before resorting to shooting again this summer.

—COLUM LYNCH



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## TRENDS

### Soft Wear for Artificial Limbs

■ Herman McKinney's new right leg looks no different from most artificial limbs, yet it is anything but typical. Shaped and fabricated by computer, the white-haired Army veteran's prosthesis is the first test of a new design system installed at the Veteran's Administration Medical Center in West Los Angeles.

Manager of the world's largest prosthetics program, the Department of Veterans Affairs helped finance the research that led to computer-aided-design (CAD) prosthetics software. The programs will be used to design the crucial component of a new limb—the rigid, plastic socket that fits over the amputee's stump. The other components, such as the leg shank, ankle, and foot, are all off-the-shelf parts that attach to the socket.

Because each stump has a unique shape, every socket must be individually crafted. But merely copying the contours of the stump won't do. Prosthetists must modify the basic contours of the device to relieve pressure from such sensitive areas as the ends of the tibia and fibula bones. Other areas, such as the mid-patellar tendon, a fibrous mass below the kneecap, can bear more weight.

Precision is essential because, like an ill-fitting shoe, "a prosthetic limb is miserable if it doesn't fit properly," says Frederick Downs, director of prosthetics and sensory aids for the veterans' agency. The stump also changes size when tissue atrophies or the amputee loses or gains a lot of weight. As a result, new amputees may need two or three socket changes in the first year.

Prosthetists have long designed and refined these sockets using plaster and hand tools. But Herman McKinney's new limb demonstrates the difference CAD technology makes. His prosthetist, Stephen Carter, started by making a cast to fit over McKinney's stump, just as he



*Herman McKinney fits an artificial leg over his new custom-made knee socket, the first such device completely designed and fabricated on a computer at the Veterans Administration Medical Center in Los Angeles.*

would to make a traditional socket. But instead of making a replica of the stump by pouring liquid plaster into the cast, Carter placed the hollow cast into a digitizer—a sleek measuring device about the size of a commercial restaurant blender. The digitizer precisely measured the contours of the cast's interior and calculated its three-dimensional coordinates to plot an image on a computer screen.

Once captured as a computer model, the shell's interior dimensions could easily be modified. With a few clicks of the mouse, Carter made the inside of the socket slightly larger in sensitive areas to ease pressure while compressing regions that could bear more weight. Before, he had to make such modifications by painstakingly adding plaster to some areas of the model and filing away plaster from others.

He then transmitted the socket's measurements by modem to a Veterans



Administration fabrication center in Seattle. There, a computer-controlled carving machine used the measurements from Carter's program to create a positive mold out of a block of plaster. A sheet of plastic, softened by heat, was then vacuum form-fitted over the mold to become the new socket. The finished socket was sent by overnight mail to Los Angeles, where Carter could test it on the patient the next day and make final modifications.

"In my wildest imagination I never thought a computer could design a prosthesis as well as I could," says Carter, who is chief of prosthetic services at the center. "But the sockets I've fit so far are a lot closer to perfect." He points out that nearly every test socket needs modification, regardless of how it is created, and for this crucial step a computer is no substitute for the judgment of a skilled prosthetist. But because designing with the CAD system is much more precise than using a putty knife and rasp, the number of modifications he has to make to a socket are much fewer than with handcrafted sockets.

Robert Pound, chief of the V.A. Prosthetics Treatment Center, says prosthetics produced by the system cost only one-fourth to one-fifth that of the traditional methods, since the prosthetist has to spend only about 4 hours working on a limb instead of 18 to 20 hours. Yet while many prosthetists have embraced this technology as quick, precise, and

potentially less expensive than conventional methods, others fear it will adversely affect a craft that, much like sculpting, has traditionally involved a manual skill.

Timothy Staats, director of the Prosthetics Research and Education Project at the UCLA Department of Orthopedics, maintains that the initial cost of a complete CAD system—about \$60,000—is steep, especially for prosthetists with small practices. Keith Vincencour, a private prosthetist in Beverly Hills, Calif., insists that CAD can't equal his judgment or sculpting skill as honed by 25 years of experience. "If you lost your leg and you wanted the best prosthesis you could get to run and jump, the limb produced by a CAD system is probably only 80 percent as good as what I could do with my hands," he contends, referring to the exactness of the final fit.

Such concerns may stem merely from the reluctance to learn a new method of working, contends Mark Magallanes of M+IND, a Seattle company that sells this CAD software and hardware. Nevertheless, the technology does appear to be gaining a foothold. In fact, Magallanes estimates about 120 prosthetics centers are currently using at least a partial CAD system. He also claims that in some centers, the systems are allowing technicians with less training to perform some of the preparatory work now done by certified prosthetists.

"This may be why some prosthetists fear that the systems might replace them," says the V.A.'s Pound. But it merely offers them a more precise tool, he says. It cannot replace professional judgment. "You still have to be a really good prosthetist to use it."

—DOUG MCCLELLAN

## ARE SOME PEOPLE MAKING A SCIENCE OUT OF DISCRIMINATION?

This provocative book debunks the notion that there is a gene for almost every disease and behavior and looks at the threats to privacy and civil liberties resulting from unregulated genetic predictions.

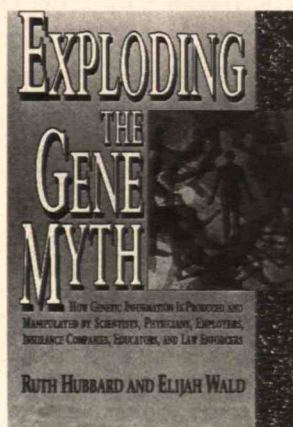
*"Hubbard and Wald have given us an accessible, yet scrupulously correct account of the truth about DNA and its real relation to human welfare."*

—R. C. LEWONTIN, HARVARD UNIVERSITY

*"Wise and witty, thoughtful and thought-provoking."*

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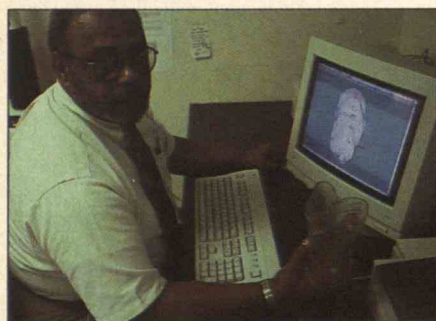
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*Robert Pound, chief of the V.A. center, says the computer offers speed and precision but cannot replace professional judgment.*



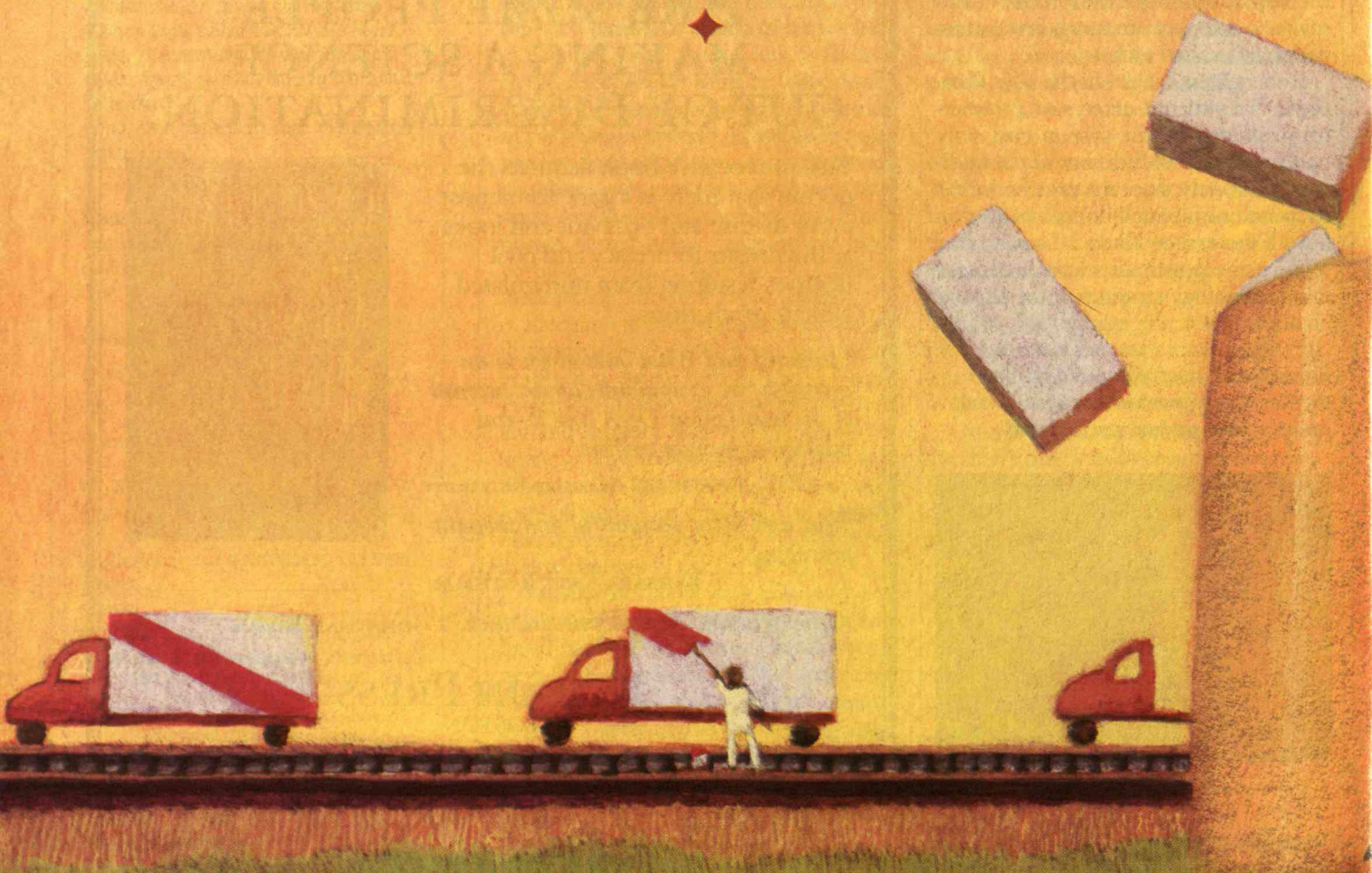


# Forging an Integrated Industrial Complex



**T**O CUT COSTS

WHILE ENSURING QUALITY,  
THE U.S. MILITARY MUST ENLIST  
CIVILIAN MANUFACTURING  
KNOW-HOW.





**T**HE specter of a rapidly shrinking defense budget is in many ways more menacing than any challenge the U.S. military has recently faced on the battlefield. Although the defense industry has designed and built the highest-performance weapons in the world—plainly demonstrated in the Persian Gulf War—maintaining that technological edge with limited resources will force the military, perhaps for the first time ever, to improve not just the ends but also the means by which it produces its arsenal.

Until now, the defense industry has remained largely unencumbered by considerations of manufacturing cost and time, at least compared with civilian industry. As a result, the unit production cost of successive generations of weapon systems has grown 5 to 7 percent each year, excluding infla-

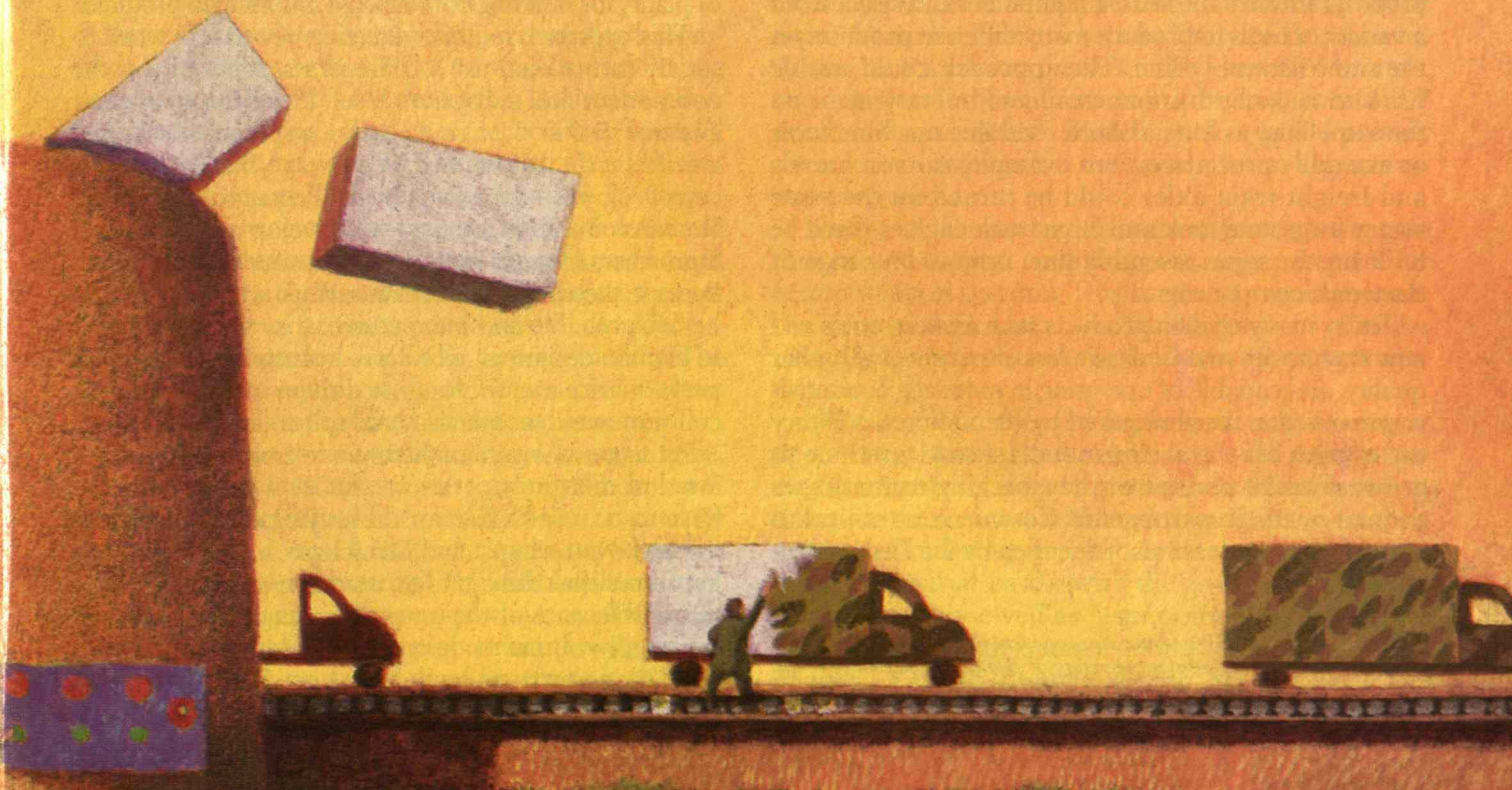
tion, since the end of World War II. As the military builds fewer of each system in the future, unit costs can be expected to move still higher.

Achieving performance improvements in new weapons also requires more time than ever before. Moving from concept to initial deployment of the Patriot missile took 18 years; the *average* for new weapons is 16 years. Because most future defense systems will depend heavily on advanced information technology, now often obsolete in 6 to 18 months, new generations of weapons will be hopelessly outdated unless development cycles can be drastically reduced.

To reverse these trends, we need a radical new approach to weapons acquisition that seeks to boost performance while cutting costs and development times. Fortunately, most if not all

By JACQUES S. GANSLER

ILLUSTRATION BY KEVIN HAWKES





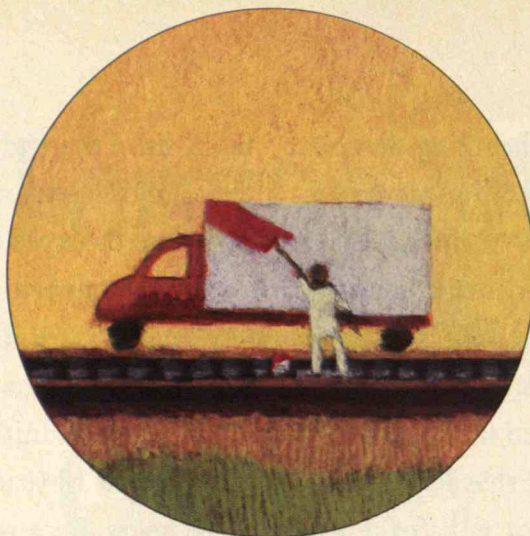
the answers reside right next door in the civilian sector, where manufacturers have simultaneously improved their products while streamlining their processes. By joining forces with civilian industry and embracing both its techniques and its products, the U.S. military can maintain its technological advantage in the face of further budget constraints.

### Built on the Same Line

One useful civilian technique is concurrent engineering. Rather than taking the approach long institutionalized in defense acquisition of first designing a new system for its desired performance and then addressing how it will be built and supported, world-class civilian manufacturers consider these issues simultaneously. They also use computer modeling and prototyping to rapidly prove out a wide array of initial design concepts as well as production processes before any parts are actually built.

A second technique that holds enormous potential for the defense industry is flexible manufacturing, whereby preprogrammed automated equipment can select from a variety of tools to produce many different products on the same assembly line. The approach could enable firms to make both commercial and military items on the same line, as long as both used like machine tools or assembly procedures. For example, cannon barrels and freight-train axles could be turned on the same rotary forge, and tank and large truck engines could be built on the same assembly line, as could a range of electronic components.

Today many civilian products such as electronics and new composite materials are less expensive, of higher quality, and capable of operating in more rigorous environments than those required by the military. Military use of such off-the-shelf products should continue to grow, since 80 percent of the emerging technologies defined by the Department of Commerce as critical to industrial strength are also identified by the Department



## FLEXIBLE MANUFACTURING COULD ENABLE A FACTORY TO MAKE BOTH COMMERCIAL AND MILITARY PRODUCTS.



ponents commercially available or civilian factories in which it can immediately be built. Rather, dual use will entail the development of military systems around state-of-the-art commercial components as well as the design of plants for building both defense and civilian products.

This approach requires directing new R&D work to satisfy future dual-use requirements, especially at the component and subsystem level. (See "Orchestrating Federal R&D," page 66.) An appropriate model would be the Millimeter Microwave Integrated Circuits Program—sponsored by the Pentagon's Advanced Research Projects Agency—to develop advanced gallium arsenide semiconductor devices for military radar. Because these high-performance chips were designed to be both reliable and inexpensive, they were attractive to civilian designers, who have in turn improved their performance and incorporated them into automobile collision-avoidance devices and toll-collection systems.

By encouraging manufacturers to embrace both civilian and military operations, DOD would no longer have to be responsible for the entire cost of maintaining and overseeing its industrial base. Instead, the market forces that drive civilian manufacturers to produce affordable state-of-the-art products would ensure that the small volume of defense items assembled largely from the same parts on the same production lines will also exhibit low cost and high quality. Actively pro-

of Defense (DOD) as crucial for military superiority. Many of these items—including advanced electronics, new materials, software, and advanced information systems—could be used to develop the anti-ballistic missiles, precision-guided weapons, surveillance technologies, and command-management systems such as those used in Desert Storm.

To take advantage of advanced civilian manufacturing techniques and the high performance and low cost of commercial components, as well as to achieve lower overhead costs on defense items through common production with high-volume commercial goods, DOD should seek to create a fully integrated—or "dual-use"—civilian-military industrial base. This would not simply mean using commercial items or facilities whenever they met military requirements; one cannot design a weapon system and then expect to find its com-

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moting civil-military integration would in turn provide the commercial sector with a significant share of the approximately \$35 billion of DOD's annual R&D funds, and a similarly large portion of the \$50 billion of annual DOD investment in procurement and capital equipment, thus greatly aiding U.S. industrial competitiveness and economic growth.

Integration with the civilian sector would also give the military the ability to quickly gear up to produce weapons and spare parts during a crisis—a capability it could not otherwise afford to maintain. Such a capacity may be essential for dealing with regional conflicts that build up with little warning.

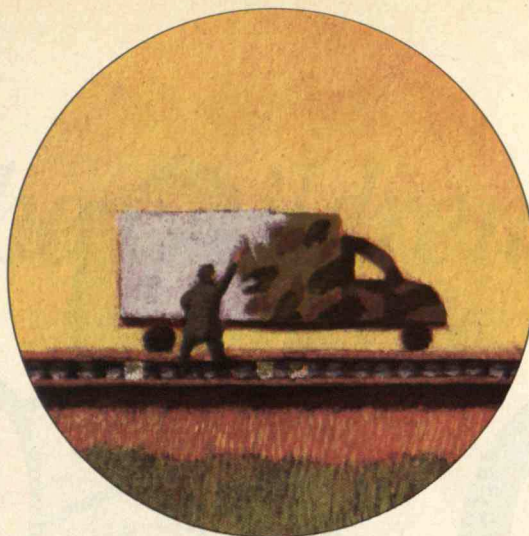
#### Removing Cultural Barriers

The needed shift toward widespread civilian and military integration is far easier said than done. Yet the current separation between these two industrial sectors is not based on technology. Rather, it stems from DOD's lack of cost consciousness in acquiring weapons as well as its rigid adherence to specifications and procurement and auditing practices that are truly cumbersome.

Because these business practices are needlessly complex, contractors such as IBM, Motorola, and Boeing design and produce defense products in isolated plants or independent divisions. This phenomenon is so wasteful that some top companies, such as Hewlett-Packard, simply refuse to accept R&D contracts from the Pentagon.

Despite growing overlap between critical defense and civilian technologies, the separation between civilian and military factories increased dramatically during the past decade because of growing congressional oversight—and micromanagement—of DOD buying practices. The result has been a duplication of billions of dollars in capital and labor investments for the two sectors.

For integration to be a viable solution for most firms, the government must take action to remove these barriers. The first step should be for DOD to immediately decide to accept commercial specifications and standards for materials and components. Any use of military standards would require written approval from the senior responsible official. Complex procurement laws intended to control quality and price would apply only to those few items that are truly unique to defense, such as nuclear



## THE MILITARY SHOULD ACCEPT COMMERCIAL SPECIFICATIONS FOR ALL BUT TRULY DEFENSE- UNIQUE ITEMS.



directly on the floor of Congress, with little or no input from the executive branch or the public. The Office of Federal Procurement Policy (OFPP), which falls under the executive branch, could serve as the focal point for creating procurement legislation that would include input from the industries most likely to be affected. Acting as a mediator between the executive branch, the legislative branches, and industry, the OFPP could arrive at specific guidelines that would protect the national interest but minimize adverse impacts on manufacturers.

Finally, DOD must simply begin to specify lower production and support costs as a primary requirement for future weapon systems. This single act would provide the most powerful incentive for designers to consider using concurrent engineering and commercial components and factories.

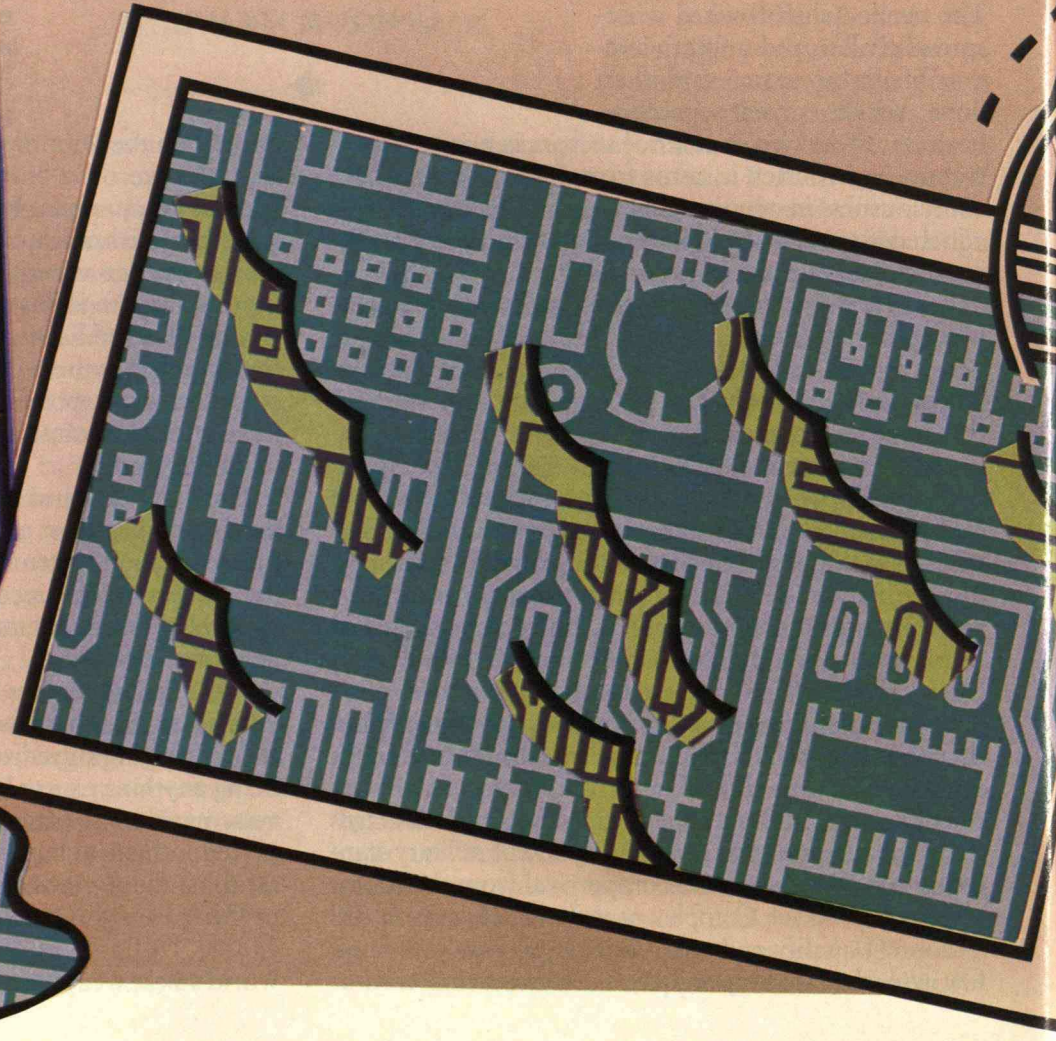
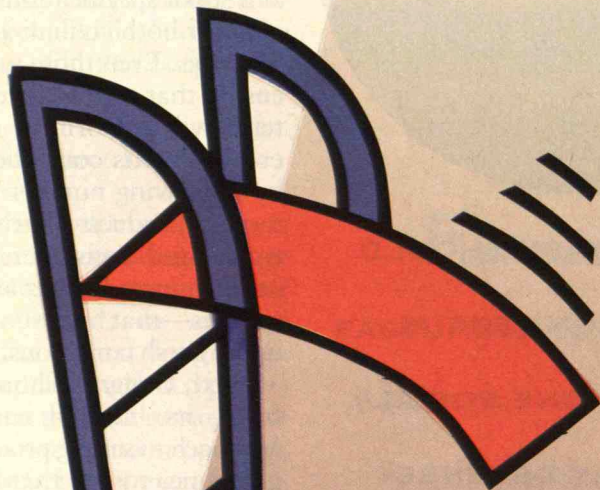
If the Pentagon does not implement such an integration strategy soon, defense contractors will remain specialized, highly subsidized, inefficient, and ineffective at doing anything except building a few expensive weapon systems. On the other hand, a shift to a largely integrated industrial base—with the government defense establishment viewed as just another buyer of high-performance, high-quality goods and services—will enable DOD to quickly design and produce the world's best weapons at far lower cost. ■

weapons. For all other items, procurement would be governed by standard commercial business practices.

Where commercial standards do not exist, DOD could help bring both the suppliers and the major buyers together to arrive at a set of specifications acceptable for both civilian and military uses. Even those written to ensure that certain defense systems will perform in extreme environments could be shared by a growing number of commercial products—such as electronic and computer components mounted to car and truck engines—that must operate under harsh conditions.

Next, Congress should move from its current unilateral approach to setting procurement guidelines to one that involves input from commercial industry. Under the current legislative process of defense procurement “reform,” amendments to appropriations bills are often made







# *The Children's Machine*

*Computers can restore  
childlike wonder to learning—challenging  
the nature of school itself.*

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BY SEYMOUR PAPERT

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IMAGINE a party of time travelers from an earlier century, among them a group of surgeons and another of schoolteachers, each eager to see how things have changed in their professions a hundred or more years into the future. Imagine the bewilderment of the surgeons in the operating room of a modern hospital. The rituals of antisepsis and anesthesia, the beeping electronics, and even the bright lights would be utterly unfamiliar to them. Although they would know that an operation of some sort was being performed, and might even be able to guess at the target organ, they would

ILLUSTRATIONS: JULIA TALCOTT



be unable to figure out what the surgeon was trying to accomplish or the purpose of the many strange devices.

The time-traveling teachers would respond very differently to a modern elementary-school classroom. They might be puzzled by a few strange pieces of equipment, but they would be very familiar with the teaching techniques. The teachers would find many surprises, however, if they went home with a student. For there they would see the child engaged, with an industriousness and eagerness that school seldom generates, in learning the rules and strategies of video games that appeared much more demanding than any homework assignment. The result would be a level of learning far beyond what had taken place in the classroom just a few hours earlier. Video games teach children what computers are beginning to teach adults—that some forms of learning are immensely compelling and rewarding, even though they require mastery of complex information and techniques. By comparison, school strikes many young people as slow, boring, and out of touch.

Some contend that it is inappropriate to expect education to undergo the same kind of megachange that has affected many other fields—such as surgery. According to this argument, the latter is susceptible to huge, technologically induced change because it is an essentially technical act. But learning is a natural act, like eating. Time travelers from a distant past would certainly have no problem recognizing that we are eating even if they fail to recognize the ingredients.

I agree that learning is a natural act if we are talking about the kind that happens between a parent and baby or between two people getting to know each other. But schooling is not a natural act. Quite the contrary: the institution of school, with its daily lesson plans, fixed curriculum, standardized tests, and other such paraphernalia constantly reduces learning to a series of technical acts and the teacher to the role of a technician. Of course, it never fully succeeds, for teachers resist the role of technician and bring warm, natural human relationships into their classrooms. Each teacher is somewhere along the continuum between technician and what I dare call a true teacher.

Numerous reformers have striven to change the educational establishment—which, for the purposes of brevity, I shall hereafter refer to as School. Most have followed the lead of John Dewey, who more than a hundred years ago began his campaign for a more active and self-directed style of learning in schools. But while Dewey's progressive educational ideas surely removed some of the cruelest impediments to the



healthy development of the child, they barely addressed the next serious question: In trying to teach children what adults want them to know, does School take advantage of the way human beings most naturally learn?

The failure of past reformers to bring about dramatically better learning has armed the educational establishment with the argument that future proposals will prove no more effective. But the establishment may be in for a shock. Strong dissatisfaction with today's schools is rapidly making it impossible to continue to tinker around the edges. And the computer is offering unprecedented opportunities to craft alternatives by creating an environment in which children could learn algebra and geometry and spelling and history in ways more like the informal learning of the unschooled toddler (or the exceptional child) than the educational process now followed in schools.

SEYMOUR PAPERT is *Lego professor of learning research at the MIT Media Laboratory. This article is adapted from The Children's Machine: Rethinking School in the Age of the Computer. Copyright 1993 by Seymour Papert. Reprinted by arrangement with Basic Books.*



## Learning by Exploration

A four-year-old girl named Jennifer, who heard that I had grown up in Africa, recently asked me whether I knew how giraffes sleep. With such long necks, she wondered, where did they put their heads when they rested?

I said (truthfully) that I didn't know, and asked what she thought. Other children joined the conversation,

books, of which quite a few were soon strewn all over my work area as I continued a rewarding chase after information about the sleep habits of giraffes.

Until recently it would have sounded silly to ask why this kind of exploration could not be available to Jennifer. Children her age cannot read, or even if they can they would not be able to conduct that kind of search.

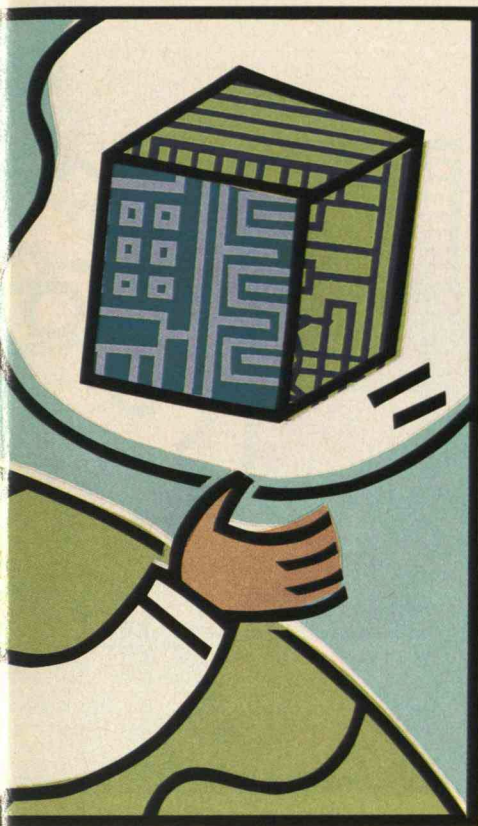
But this answer is no longer convincing. No technical

obstacle stands in the way of making a machine—let's call it the Knowledge Machine—that would put the power to know what others know into Jennifer's hands. Extremely primitive examples are now trickling into commercial production under names like interactive video, electronic books, compact disc interactive (CDI), or in more elaborate versions, virtual reality. What separates these endeavors from a true Knowledge Machine is no longer a lack of storage or access technology but the size of the effort needed to bring together the knowledge. Still, the enormous potential market for such a machine makes its eventual appearance inevitable.

A Knowledge Machine would enable a future Jennifer to explore a world significantly richer than what I was offered by my printed books. Using speech, touch, or gestures, she would steer the machine to the topic of interest, quickly navigating through a knowledge

space much broader than the contents of any printed encyclopedia. Whether she is interested in giraffes or panthers or fleas, whether she wants to see them eating, sleeping, running, fighting, or birthing, she would be able to find her way to the relevant sounds and images. This availability will one day extend to experiencing the smell and touch of being with the animals.

Educators have long assumed that reading is the student's principal access route to knowledge. The educational development of children is therefore seen as rigidly dependent on learning to read in a timely way. But the prospect of a Knowledge Machine suggests that this basic assumption may start to unravel within a decade or two. Written language is not likely to be abandoned. But we need to think anew about the position assigned to it as the prerequisite to children's accumulation of knowledge. Children who grow up with the opportunity to explore the jungles and the cities and the deep oceans and ancient myths and outer space will



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and I gleaned a bumper crop of theories. One suggested that the giraffe sleeps standing up, like a horse. Someone offered that the head might stay up high. Someone said the giraffe could put its head on the ground if it did a split. Jennifer showed obvious delight when she hit on her own theory: that the animal finds a tree with a branch for its neck.

In this conversation we see two sides of the intellectual life of children of this age: the coexistence of a remarkable capacity for making theories with a nearly helpless dependence on adults for information that will test the theories or otherwise bring them into contact with reality. Jennifer is in a stage of transition. Younger children are more completely engrossed by a world within the range of immediate exploration. Later, they will be able to explore a world beyond touch and sight.

That evening, still stimulated by my talk with the children, I threw myself into an exploration of giraffes. I do not keep a pet giraffe, but I do have a library of



be even less likely than the players of video games to sit quietly through anything even vaguely resembling the elementary school curriculum as we now know it. And why should they?

As an infant, Jennifer acquired knowledge by exploration. She was in charge of her learning. Though her parents put knowledge in her path, she chose what she would investigate, determining for herself what she would think about and how she would think about it. Preschoolers do not deposit the information adults try to feed them in their memory banks in the same way they learn to do later on. Instead, they *metabolize* the knowledge, assimilating it with all their other direct experiences of the world.

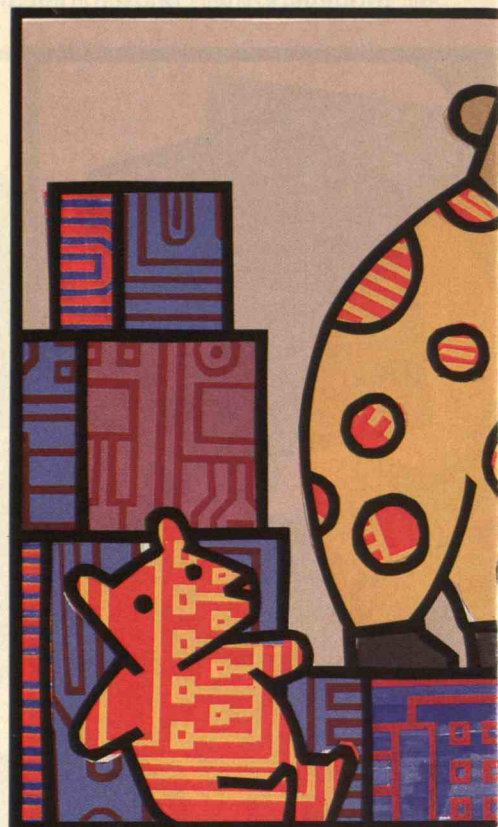
When Jennifer asked me about the giraffe, she was at a stage when more questions were coming up in her mind than she could answer by direct exploration of her immediate world. She responded in a way she had been taught to respond: ask a sympathetic adult who would reward her curiosity with praise. While pressure toward this mode of learning—through being told, through accepting authority—has its roots in a student's own curiosity, it will be massively reinforced by the orthodox educational system of School.

In common parlance, "literacy" means the ability to read and write. However, thinkers who try to look more deeply into what education means have scathingly criticized the idea that illiteracy can be remedied by teaching children the mechanical skill of decoding marks on paper. Becoming literate means thinking differently than one did previously, seeing the world differently. The Knowledge Machine would offer children a transition between preschool learning and true literacy in a way that is more personal, more gradual, and therefore less precarious than the abrupt transition we now ask children to make as they move from learning through direct experience to using the printed word as the source of important information.

Most educators assume that School's way is the only way because they have never seen or imagined convincing alternatives. But even the most confirmed Schooler will readily concede that some important learning occurs under conditions very different from

School: babies learn to talk without curriculum or formal lessons; people develop skill at hobbies without teachers; social behavior is picked up other than through classroom instruction. A Schooler might grant that a Knowledge Machine could extend the scope of such learning to include faraway giraffes as well as nearby puppies, but still be dubious that any but the

**A**  
***"Knowledge  
Machine" would  
let a child explore  
a world significantly  
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printed books.***



most gifted children could learn geometry or algebra through such unorthodox means.

They are skeptical partly because almost all experiments purporting to implement progressive education have been disappointing. Innovators have put forward the bold perspective that children would learn better if learning were a part of living experience or if they were in charge of their own learning processes. But while such ideas resonate with a respectful attitude toward children and a democratic social philosophy, most practitioners who tried to follow the seminal thinkers were forced to compromise so deeply that the original intent was lost. It is simply double-talk, for example, to ask children to take charge of their own learning and at the same time order them to "discover" something that can have no role in helping them understand anything they care about.

To say, therefore, that progressive education has failed is like saying that Leonardo da Vinci failed in his attempts to invent a flying machine. The Wright broth-



ers succeeded where Leonardo could only dream because a technological infrastructure supplied materials and tools and engines and fuels, while a scientific culture supplied ideas that drew on the capabilities of these new resources. When educators tried to craft a school based on progressive principles, it was as if Leonardo had tried to make an airplane out of oak and power it

computers for an hour a week. By inexorable logic the next step was to introduce a curriculum for the computer.

Thus, instead of cutting across and so challenging the very idea of subject boundaries, the computer was now defined as a new subject; instead of changing the emphasis from impersonal curriculum to excited live exploration by students, the computer was now used to reinforce standard hierarchical thinking. What had started as a subversive instrument of change was neutralized by the system and converted into an instrument of consolidation. The development of computer labs seems to me a kind of immune response by School to a foreign body; the logic of the process was to bring the intruder back into line with School's ways.

The following story illustrates the perverse consequences of this assimilation. As a fourth and fifth grader at the Hennigan School in Boston, Richard had almost daily experience with Logo (a programming language developed for children that enables them to produce screen graphics). Richard had acquired considerable competence both in the technical aspects of programming and in the spirit of using the language as a medium for other work. At the school he attended after graduating Hennigan, however, he was not allowed to work with Logo. His teacher explained: "Richard already knows Logo, so I had him learn something else."

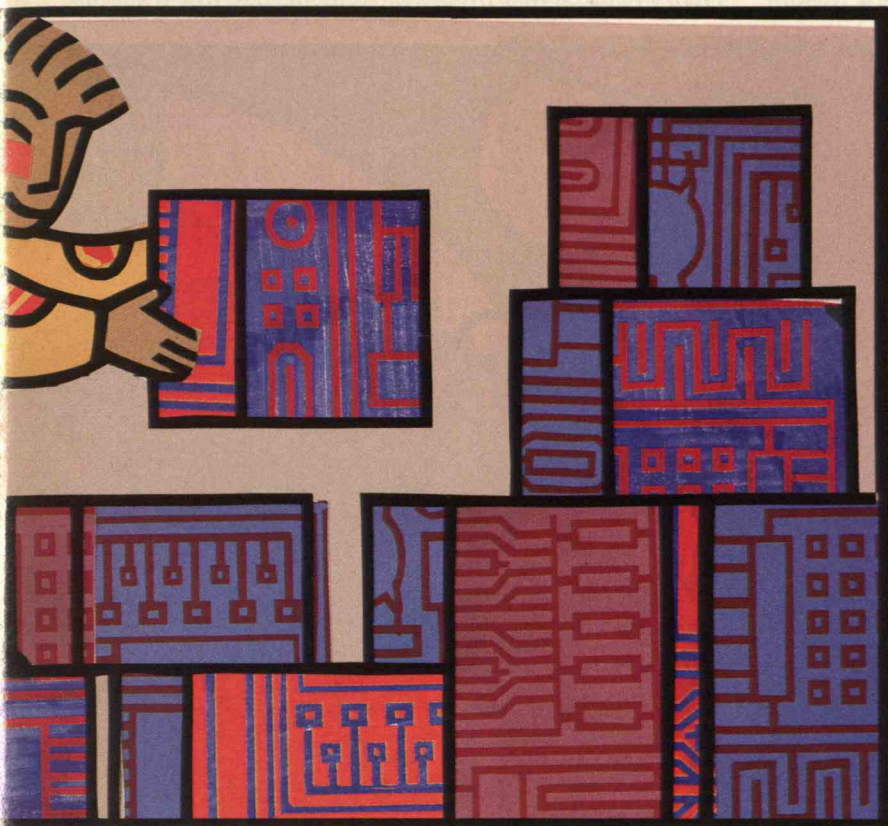
with a mule. Now that powerful computers have become small and inexpensive, education can finally follow the progressive path charted so long ago.

### Neutralizing a Subversive Instrument

Although the technology for fundamentally reforming education is at hand, a persistent tunnel vision continues to distort public discussion of the relationship between technology and schools. In the early 1980s, when there were few computers in schools, they were placed in the classrooms of teachers who showed the greatest enthusiasm. Most of these teachers employed computers to cut across School's balkanized curriculum and go beyond impersonal rote learning. But as computers proliferated (and became status symbols), the administrators moved in. From their point of view, it made more sense to put the computers together in one room—misleadingly named a "computer lab"—so that all the children could come together and study

Richard's experience captures one of the chief differences between learning at School and all other learning. In life, knowledge is acquired to be used. School learning is treated like savings, to be deposited in a bank for the future. In the case of computer knowledge, the banking approach is often justified by the argument that it will stand the students in good stead when they grow up and look for jobs requiring computer skills.

But if "computer skill" is interpreted in a narrow sense of technical knowledge, there is nothing the children can learn now that is worth banking. By the time they grow up, the computer skills required in the workplace will have evolved into something fundamentally different. What makes the very idea of banking computer knowledge truly ridiculous is that it undermines the only really important "computer skill": the habit of using the computer for doing whatever one is doing. Yet this is exactly what was given up in shifting the computer away from the classroom.





## Creative Collaboration

By entering the culture of the school, computers can weave themselves into learning in many more ways than its original promoters could possibly have anticipated. Even now I can close my eyes and see a 1981 scene in a fifth-grade classroom in a New York City public school. At one end of the room, a teacher was giving a lesson at the blackboard; at the other, a cluster of students was working to create spectacular visual effects on two computer screens. Colored shapes moving in complex intertwining paths spoke immediately to the students' choreographic talent, their sense of movement and drama.

The front and the back of the room were separated by much more than a difference between the technology of the computer and the technology of the blackboard. In front, the students were following someone else's agenda; in the back, they were following their own. The students I remember most vividly from this scene were Brian and Henry.

Although these two boys had been classmates for four years, they hadn't talked to one another much until the computers brought them together. Brian had always cared about music and dance. Watching him, one had no doubt that the sensory and bodily aspects of the world were important to him. He was also a fluent storyteller—but his writing was plodding and wooden. Henry, in contrast, had always been a math whiz and his fantasies were in science fiction. Henry was awkward in his movements, one might say out of touch with his body, but until the arrival of the computers he had not experienced this as a deficiency. Science and mathematics, the areas he enjoyed and excelled in most, seemed to have no relationship with sensory enjoyment and physical action.

Henry quickly understood the technical side of programming. His talent for mathematics paid off in his easy mastery of techniques for creating and directing the motion of figures on the screen. He learned how to make an object gradually accelerate from an almost imperceptibly slow motion. He realized that the same techniques could be used to make a sound mount in pitch from a low growl to a high scream and eventually disappear into the ultrasonic range.

Although he took pleasure in the mathematical cleverness behind his displays, Henry was disappointed by

the total effect. He could feel that his creations lacked something he did not know how to achieve or even name, certain qualities that another fifth-grade student described as grace and excitement. Perhaps for the first time in his life, he felt the pang of an intellectual limitation. His mind was ready for a breakthrough.

One day, watching Brian dancing in a school corridor, Henry realized that Brian's movements had just what his



screen displays lacked. This realization led to a long-term working relationship: together the two boys began to create something that neither could even imagine alone, and in doing so learned much more than math test scores are capable of measuring.

In creating their dynamic displays, the boys were engaged in difficult mathematical exercises. For instance, they needed to know at what speeds two objects have to move so as to arrive at the same place at the same time if one follows a path whose length is 35 percent the length of the other. This required a description of the movements in mathematical language that went beyond even Henry's previous knowledge. They represented an object's speed as a variable, and then set up formulas to vary it. They learned to think of directions as angles measured in degrees. They picked up the idea of doing geometry by coordinates in a way much closer to the living and personal discovery through which René Descartes first came upon it than to the



deadly formal presentation of math textbooks. Their activity included many calculations of the sort typically taught to fifth graders (together with more sophisticated mathematical thinking) but the calculations occurred in the course of doing a larger and personally motivated project.

The boys had to scrounge and scurry, asking help from a teacher, looking in books, working by analogy

skiers would spend all their time on the gentlest slopes.

For Brian, the opportunity to make animations provided a way to extend the domain of his fluency—programming, after all, is a form of writing. Henry acquired a feel for creating grace and excitement that have stood him in good stead for writing a science report, composing a story, or simply telling a joke. Given time, it could even have affected the way he moved his body. It might have changed his social life. More subtly and more profoundly, it might have opened him to a greater variety of ways of knowing.

### Encouraging Diversity

I believe that this country's educational system is fundamentally as irrational as the Soviet command economy, and for ultimately the same reason. It does not have the capacity for local adaptation that is necessary to function and evolve in a changing environment. This irrationality is reflected even in many of the proposed reforms. Mikhail Gorbachev struggled to reform a system in serious crisis without calling into question the foundations on which it was built; I see most of the loud talk about "restructuring" in education in much the same light.

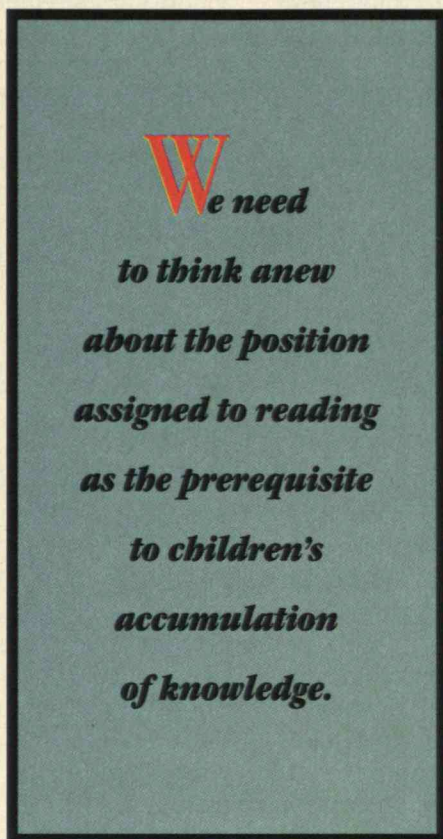
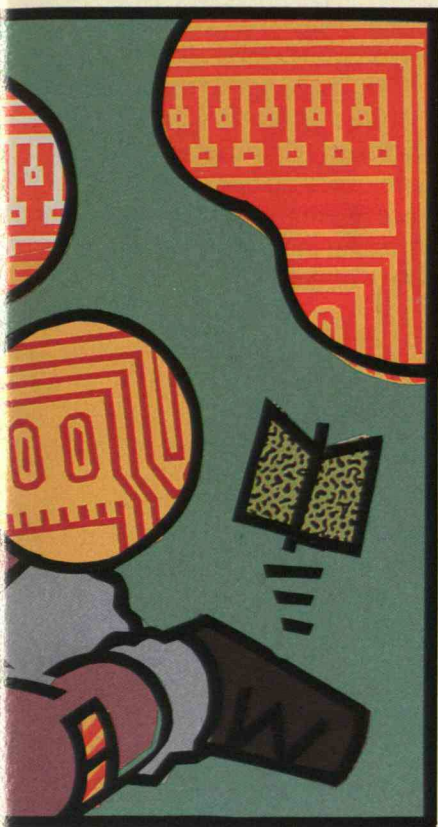
Imagine an elementary school teacher, let's call her Martha, who reads this article and decides that she would like to use computers to teach

to other situations, trying to invent a method, resorting to trial and error. Children never seem to mind such tasks: what makes School math repugnant for so many and boring for others is not that it is "hard" but that it is a senseless ritual dictated by the agenda of a fixed curriculum.

The computers enabled Brian and Henry to experience mathematics as something to be used purposefully; they felt it as a source of power in pursuing important and deeply personal projects. I am not sure that people who have not experienced mathematics in this way can fully appreciate how heady it can be. This does not mean that doing mathematics became easy: quite the contrary, just as when one learns any complex procedure, there was the frustration and never-ending struggle of mastering new techniques and handling new challenges. It became harder as they took on more serious problems. But when someone is deeply involved in something, "easy" is not what they are after; if it were,

math in different ways. Her first problem is to get some equipment. Ten years ago this would have been mainly a financial challenge, but for Martha, School's "immune response" has created a different kind of problem. Today, it is hard because her school has already invested heavily in computers but is using them for other purposes—perhaps for drill and practice, perhaps to teach computer literacy.

Martha will also have trouble getting her school's approval to participate in a training program that not only gives her technical knowledge about computers but also exposes her to the spirit in which they can best be used in the classroom. Administrators will point out that the school system, or perhaps its computer vendor, provides seminars on using computers. Teachers learn the essentials of computer literacy in a few afternoons; a three-week course isn't really necessary, she'll be told. Besides, the school has already decided how children should learn math; it is not for her to





strike off in new directions.

Real change in schools will require more than isolated innovators. A new culture of learning must evolve, complete with a literature, with jokes, with new ways of thinking about what is to be learned and how to learn it. The match between parents and the school is also an important factor in how it will develop. If teachers like Martha are really going to explore new ideas, they are likely to act in ways that may go against the grain of how parents think about learning.

The "new math" movement a generation ago provides an instructive example of the effect of unfavorable reactions of parents. During the 1960s, teams of mathematicians, psychologists, and teachers rightly decided that traditional teaching of mathematics placed too much emphasis on rote learning, arguing that the remedy was to teach children the underlying logic. Unfortunately, few parents understood the new math, and many ridiculed what they saw their children doing. Parental incomprehension added to the sense among children that it was acceptable not to understand math. In contrast, the use of computers to teach math has an immediate public-relations advantage that can be used as a bridge for parents to understand educationally sound work. A typical parent will react much more positively to a child coming home and saying "I did math with computers" than to one who talks incomprehensibly about set theory.

In Denmark, the government funds numerous groups of citizens to set up "little schools." A central feature of the little school idea is that it permits a group of like-minded people—teachers, parents, and children—to act together on the basis of personal beliefs. Instead of imposing a common way of thinking on everyone, it allows people with a shared way of thinking to come together to develop new ideas about learning.

Even if nothing else changed, the simple fact of being a little school could make a decisive difference if it led to a self-selection of parents who favored its particular educational philosophy. Instead of struggling with a skeptical and distrustful parent body, the school would benefit from the commitment the parents made in selecting the school.

We're starting to see encouraging steps toward such experimentation in this country. New York City has established school districts with a large degree of autonomy over their elementary and junior high schools. Some of these districts are allowing groups of teachers, generally between six and ten, to submit proposals to create a separate school. The spin-off has the right to set its own educational policy, within guidelines approved by the district's school board.

Some readers may object that little schools would foster a greater balkanization of communities than already



exists. But new electronic communication technologies will permit contact among schools far beyond anything known in the past. It is no longer necessary to bring a thousand children together in one building and under one administration to develop a sense of community.

Over the long run, I don't see that we need large schools at all; whatever advantages they once offered will vanish. This is most strikingly true of the ability to afford a large library. In the electronic era, every school, indeed every home, will have access to myriad reference books as well as the world's literature without the reader's having to move from armchair or playroom. Even the belief (always more or less illusory) that large schools offer a better chance of employing teachers in whatever areas might interest an individual student is undermined by the possibility of getting in touch with experts at a distance.

### Peephole into the Future

Around the world, children have entered a passionate and abiding love affair with the computer. Notoriously, as with most other love affairs of their children, parents fail to understand it. In this case, they are frightened by its intensity and especially distressed by what many perceive as the mindlessness of the games that have become its most visible manifestation and a peephole into the future. The intensity of feelings reflects children's avid response to a new medium that matches their ways of knowing better than either print or television. If the word "mindless" applies here, it is not to the children but to the adults—and especially to School, a sleepwalking dinosaur of an institution that lumbers along a set path, more and more out of alignment with the society it thinks it serves and less and less able to channel the energy and vision of teachers who try to work in it.

I speak of these children's experiences as a peephole into the future to counteract a literal-minded "what you see is what you get" approach to evaluating the potential role of computers in the learning environment. What can be seen today is certainly an intimation of what will come, but only in the way the Wright *Flyer* prefigured jet transportation. Reading the significance of the Wright brothers' first flights required an effort of imagination to grasp the principles they embodied and the social and technological evolution that they would seed.

So too with education. The coming together of computers and children has historical importance far beyond what can be measured by performance in present-day schools. Like the Wright *Flyer*, it can be appreciated only by doing the hard work of projecting the present into a vision of the future. ■



# MIT

JULY 1993



*BUILDING TEAM PLAYERS  
WITH LEADERS FOR MANUFACTURING*

*SEE PAGE M15*



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**COVER:** There they were, the future hope of U.S. manufacturing, out in the woods on Thompson Island in Boston Harbor, trying to figure out how to get every member of their group over the top of an industrial spool suspended on a pipe between two trees. Without careful planning and coordinated teamwork—sound familiar?—the last person in line would be unable to navigate the unstable, unwieldy spool. It was the Outward Bound portion of orientation for the new crop of students in MIT's Leader's for Manufacturing program, and it made the point that this educational experience would be different from any other they'd had before. Photo by Kate Miller



## A Moralist Teaching Japanese History

John W. Dower likes working in the margins—tackling his discipline in unconventional ways. And at MIT, he finds many kindred spirits. A humanist, historian, and social scientist, Dower is challenging tomorrow's scientists and technologists to think about the consequences of their work.

As Henry R. Luce Professor of International Cooperation and Global Stability, he is not only a rarity at MIT, but also in the United States. "He's among the half-dozen leaders of Japanese history in this country and one of the few foreigners writing about Japan who is of interest to the Japanese," says Chalmers Johnson, a noted Japan specialist and colleague of Dower's when both were on the faculty at the University of California at San Diego (UCSD). But instead of focusing on traditional issues of state, Dower, 55, is known as a moralist, one who addresses difficult issues in history such as racism.

Perhaps his most famous and influential work is *War Without Mercy: Race and Power in the Pacific War*, written in 1986. It received a National Book Critics Circle Award and in Japan the Masayoshi Ohira Memorial Prize for distinguished scholarship on Asia and the Pacific.

When Dower joined the history section of MIT's School of Humanities and Social Science two years ago, he found that students wanted to know how Japan got so rich so quick. "They wanted a simple 'secrets of success' course. My task is to show that there are no secrets, but a long, complex history [that includes] the social costs of industrialization," Dower explains.

One of Dower's hallmarks is his use of visual materials to flesh out the bare bones of history. In his class, for example, he shows Japanese and American propaganda films to convey the emo-

tions that raged during World War II. He says students are fascinated by the "raw" stuff, by comparing various forms of overt propaganda and entertainment. "Students are appalled by the crudeness of American racism. But in the end, many students in their papers talked about similarities between the Japanese and Americans rather than differences. This broke through a lot of the propaganda," he says.

Dower also shows a set of powerful drawings of atomic bomb victims—the *hibakusha*. He acknowledges that the drawings can be overwhelming—one student fainted after seeing them. The staggering numbers of deaths become meaningless and dehumanize an act of horror, Dower says, and it takes something like the drawings to give the bomb blast a human scale.

After earning a BA in American studies from Amherst College, he earned

*Below: Professor John W. Dower in his office at MIT.*





master's and PhD degrees in Asian studies at Harvard. Dower first went to Japan in 1958, the summer after his junior year. That trip was the start of a lifelong love of Japan that led him to a distinguished career first as history professor at the University of Wisconsin in Madison and later as professor of history and Japanese studies at UCSD.

Dower's departure from UCSD "left a vacuum that still isn't filled," Chalmers Johnson says. "Dower was very highly regarded and well known for his work here. But I was not aware that he has a missionary streak that would make engineers look up from their CRTs."

"I feel a greater responsibility [at MIT] than when I'm with ordinary arts and science majors," Dower admits. His students operate in an arena that is rational and well-defined, predicated on laws of cause and effect and assumptions that there are correct and incorrect paths to pursue. "But the real world is a mess," Dower says, and his aim is to make scientists and technologists more comfort-

able with ambiguity and multi-causal phenomena like history. □—*Lori Valigra* (The author is a freelance writer specializing in Japanese science and business issues. She just completed a year at MIT as a Knight Science Journalism Fellow.)

## Transportation Professionals Convene

Close to 100 alumni/ae, faculty, and staff convened in Cambridge in April to celebrate their shared connections to MIT's Center for Transportation Studies (CTS) and the standard-setting Master of Science in Transportation (MST) program that the center administers. MIT boasts roughly 600 graduates in transportation, who are now working in government, research, and industry or pursuing doctoral degrees. Of that number, some 150 graduated through MST, established in 1978 as one of the first interdisciplinary degrees in the field.

A panel on transportation education gave participants an opportunity not only to discuss MIT's program but to compare it with offerings at other universities. A distinguishing characteristic of MST, for example, is its combination of structure and flexibility—students have the option of making connections all over MIT and elsewhere to customize a program that meets their goals. But as noted by Mark McCord, PhD '83, now a faculty member at Ohio State, that model is not appropriate for every institution. Roger Teal, '72, agreed, saying that a program similar to MST did not work at the University of California/Irvine because students there were uncomfortable with the myriad choices.

Panelist Nigel Wilson, SM '67, PhD '70, professor of civil and environmental engineering and former chair of the program, noted that MST is recognized for

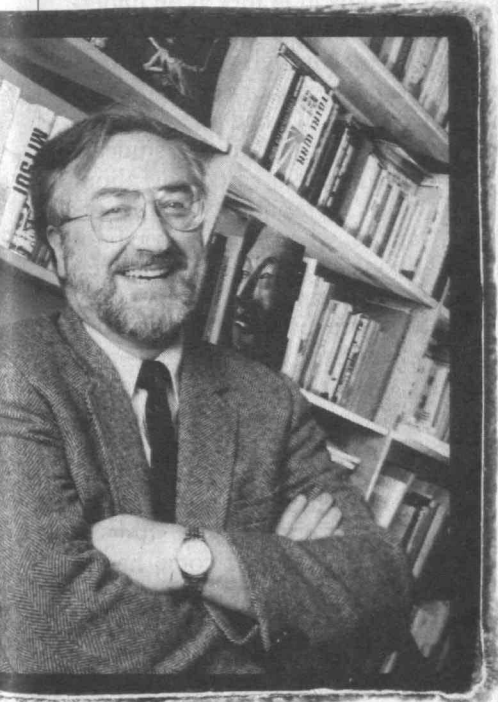
the weight it gives to rigorous mathematical analysis—an emphasis woven into the recently published strategic plan that will guide the program's future development.

Analytic skills are necessary but not sufficient, observed Richard Soberman, SM '61, PhD '63, of the University of Toronto. Transportation planners have to be able to formulate solutions, he said, and defining the problem is often the biggest hurdle. That appraisal was echoed by Fred Salvucci, '61, SM '62, a member of a panel that focused on the observations of practitioners in the trenches.

Salvucci, three-time secretary of transportation in Massachusetts and now a senior lecturer in Course I, told a story that illustrates the impact of definitions on the outcome. As a student in the class of Professor Sheff Lang, Salvucci and his colleagues were presented with a case study of a dam site in Haiti. They labored over designs to make the dam bigger and better, but Lang reined them in, prodding them to consider what impact a huge dam would have on the regional population. "[The exercise] taught us that we held a greater responsibility than simply responding to the dictates of politicians," Salvucci remembers.

Transportation planners are often busy solving the wrong problem, he said, and the most important practice he adopted in his own career has been stepping back from a situation to identify the real issues. Salvucci also pointed out a pitfall of overreliance on analysis. "Cost/benefit analysis often sees jobs as a cost," he said, "which can lead us to ignoring the benefits of creating jobs. On the other hand, political analysis often interprets jobs as a benefit," which can lead to sins on the other side of the ledger.

A memorable feature of the panel of practitioners was that speakers repeatedly referred to the need for communication skills in writing and oral presentations, in addition to strong analytic







*For all its intellectual content, the April reunion of MIT transportation professionals also included plenty of time to trade war stories and socialize. From left to right: Anne Herzenberg, SM '82, manager of the MBTA Everett Rail Yard; Carl Van Dyke, SM '81, president of MultiModal Applied*



*Systems in New Jersey, and his wife, Louisa Ho; Paul Thompson, SM '82, principal at Cambridge Systematics; and Anne Bickford, SM '83, project manager at Alternate Concepts in Boston.*

abilities. Panelists came from diverse backgrounds: in addition to Salvucci, the panel included Steven Ditmeyer, '63, director of research for Burlington Northern Railroad and veteran of years of experience with the Federal Railroad Administration and the World Bank; and Brian Kullman, SM '71, PhD '73, longtime consultant and now director of operations for R.R. Donnelley Logistics Services. Moderator was Scott Nason, SM '77, vice-president of operations planning and performance at American Airlines. While they all had lists of attributes they valued from their MIT education and lists of valuable skills acquired on the job, they were of one mind about writing and speaking as essential qualities for anyone who wants to advance into higher management.

#### The Fertile Minds of Fellow Students

A recurring theme in alumni/ae discussions was how much everyone had learned from their fellow graduate students during their time at the Institute.

The diversity of student backgrounds, in fact, was rated second only to overall quality of education as the greatest strength of the MST program and a key to its continued success. That's no accident, according to Joseph Sussman, PhD '68, head of the Transportation Systems Division in the Department of Civil and Environmental Engineering. When faculty review applications for each year's entering class, Sussman said, assembling a cohort of individuals who can learn from each other is a high priority.

Sussman saw the results of that emphasis on student diversity when he and Carl Martland, '68, SM '72, CE '72, a principal research associate with CTS, recently convened a gathering of the MIT Rail Group, a collection of students and faculty who are working on diverse aspects of rail research. About 15 people showed up to brainstorm about potential new directions for rail research at MIT, and one of the topics was high-speed rail.

The meeting was "an extraordinary couple of hours," Sussman said. "It

turned out that one of our first-year MST students had spent a considerable amount of time in France as an undergraduate, working on the TGV [*train à grande vitesse*, or high-speed train] as well as a summer working on high-speed rail in Germany. We had three students from the East Japan Railway, students from China and Korea talking about applications there, and two students from Taiwan, where a high-speed rail link of about 200 miles is being developed through a congested corridor.

"In total, we discussed seven countries, including the United States—particularly the Northeast Corridor—as candidates for high-speed rail. I doubt there are many educational groups in the world that could put together such a discussion strictly from their own ranks. When we talk to prospective students about why they should come here," Sussman said, "this is the kind of thing I think of." □ —*Scott Campbell (The author is a writer/editor for the Center for Transportation Studies and the School of Architecture and Planning.)*



# LEADERS FOR MANUFACTURING

## *The Student Experience*

No reader of the business press can doubt that the U.S. companies producing cars, airplanes, electronics, and computers—among other products—are being challenged by strong competitors based in other countries. Manufacturers will have to operate effectively in a climate where pitching new products and services that are higher in quality and lower in price is not the exception but the norm. It won't be enough to simply react to change; they'll have to capitalize on it.

Launched in 1988, MIT's Leaders for Manufacturing program (LFM) was a partial response to a national debate about how American industry should respond to this new playing field. Created in the wake of the now-famous report of the MIT Commission on Industrial Productivity, "Made in America" (see *Technology Review*, August/September, 1989, page 28), the program is a collaboration between 13 major corporations and the Institute's Schools of Engineering and Management.

In its original charter, LFM pledged "to discover and codify guiding principles for world-class manufacturing, educate future leaders for manufacturing firms, and otherwise infuse important principles and technologies into the nation's manufacturing practice." It was envisioned as a model that could, over time, help shape the industrial landscape from the inside out.

Part research laboratory, part elite farm team, the LFM program was approved initially as a five-year experiment, and David Warsh, business writer for the *Boston Globe*, has observed that, "so far, [LFM] has gotten rave reviews." Since its inception, Institute administrators have rarely missed an opportunity to showcase the program as a shining example of what MIT is and should be doing to promote the national weal. Provost Mark Wrighton says that "MIT is committed to continuing the pro-



*Some of  
the most trenchant  
comments on MIT's  
showcase program to  
revitalize U.S. industry  
come from the students  
and graduates.*



gram," with added support from his budget for academic innovation.

There is no way to quantitatively measure the impact of this small caste of MIT-trained reformers taking their places within U.S. corporate culture. But after five years, it is possible to see the shape of the experiment and what it means for the students who go through it.

LFM students—most in their 20s or early 30s—are required to have an

undergraduate degree in engineering or science, and a few hold graduate degrees as well. Some come to the program right out of college, having attracted the attention of scouts who administer corporate scholarships. Others have years of experience under their belts and enroll knowing that the two years in school will involve a drastic cut in income. Ann Robinson, SM '93, for example, sold her house in Texas and took a leave of absence from her job as a manufacturing manager at Ethicon, a medical products subsidiary of Johnson & Johnson.

"Ethicon was just touching on the subjects of lean manufacturing, just-in-time processes, and employee empowerment, and [it is] struggling with how to implement them," Robinson says. "I thought the [LFM] program could give me some insights I could bring back."

Students undertake a two-year master of science program, earning a degree from both the Sloan School of Management and from one of five engineering departments. "The cynical view is that they slap two degrees together," explains James Lawton, SM '90, who graduated with the original LFM class of 20 and now serves on the program's Operating Committee. "But in fact, the program adds value by building a framework of two perspectives—a different, bigger picture. By the time we graduate, we've all bought into the mission that the U.S. economy cannot survive solely as a service economy, and we must act to improve American manufacturing."

The program kicks off with a summer session designed to foster interdependence. By all reports, it works—profoundly binding each entering class together. Enrolled in identical introductory courses and sharing one big office space, the class can hardly help feeling like a unit. But as Stephen Chong, SM '93, points out, the critical factor is an Outward Bound experience



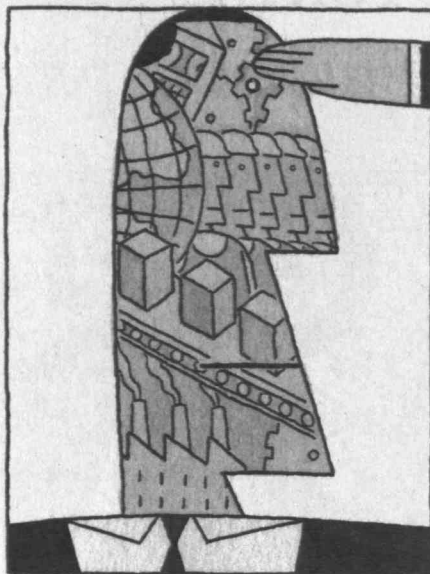
on Thompson's Island in Boston Harbor. "We were dealing with obstacle courses and physical challenges that we couldn't handle without working as a team," he remembers.

It's a strategy that makes sense to the students. Lynn Cascio, SM '93, an electrical design engineer with five years of work experience, points out that as an undergraduate "you work by yourself and get rewarded by yourself, but in industry you have to get used to working with others in meetings and on teams." The collaborative way of working spills into the projects, papers, and informal study groups that will dominate the students' time on campus. "You have to find out who has what kind of expertise and decide how to divide up the work quickly—the timelines are very short," says Cascio. "Even finding a time to meet can be a challenge."

In LFM's formal curriculum, a class in "tolerance design" is back-to-back with sessions on how to read a financial statement; "tools and techniques" are offered alongside classes in negotiation and marketing. Some team-taught courses, such as "Product Design in a Manufacturing Environment" are structured to reflect the business goal of integrating the steps of the manufacturing processes—from decisions about what to build through product distribution and maintenance.

Weaving engineering and managerial course offerings into a seamless whole, however, is difficult. Robert Thomas, associate professor of organizational studies, admits, "We have to squarely face the fact that we don't always know whether we're teaching something because we've always done it that way or because it's genuinely useful." Faculty have to negotiate which topics are covered in which classes, and they may have to rewrite courses they have taught for years to accommodate these program-wide choices.

Some students with work experience have noted that examples discussed in class don't always give a clear picture of problems faced by manufacturers in the real world. They say that faculty tend to



*Students  
realize that some  
of the most troubled  
giants among U.S.  
corporations offer  
the greatest opportunities  
for change.*



present streamlined models for complex systems—not surprising in a program designed to "discover and codify guiding principles for world-class manufacturing." But classroom study is inherently idealized, responds Thomas Eagar, '72, professor of materials science and engineering and co-director of LFM.

"The university is an artificial environment, and the world is always more complex than the way we teach it in the classroom," says Eagar, who also holds an ScD from MIT. "That doesn't mean that what we teach isn't worthwhile. The manufacturing environment has

different goals than the university, [including having to] deal with external suppliers, labor relations, and getting products out the door. That's why we have an internship component—the students spend 25 percent of their time in the real world instead of learning it all on campus."

Each of LFM's corporate sponsors has a certain number of internship slots associated with specific projects. Except for the students like Robinson who have commitments to their home companies, the LFM students choose a company and an assignment based on the project definitions, their own backgrounds, and their long-term career interests.

My biggest surprise was how important the organizational issues are," confesses Mark Mastandrea, '87, SM '87 and '93. "You sort of think those are the squishy courses and don't know how much time you want to allot to them. You think you want to [focus on] scheduling and queueing theory instead." But on-site as interns, as well as in case-based courses, students see the difficulty of turning the variables of the manufacturing enterprise into a set of principles and procedures. Mastandrea and his peers found themselves grateful for the "people skills" the program develops.

William Hetzel, SM '93, who interned at Eastman Kodak, believes that interns have a unique chance to see an organization more objectively than insiders but in more depth than hired consultants. The spring seminar prepared them well, he says, focusing on how to effect change as well as solidifying skills that would make change possible. "I have a bag of tools," Hetzel says, "[ranging] from linear programming models to my chemical engineering material balances, to what I know about organizational behavior and team-improvement activities."

As an intern, Hetzel had "the luxury of not having allegiance to one division or one boss, and that was a perfect role for an LFM student: looking for where the value lies for the entire corporation."

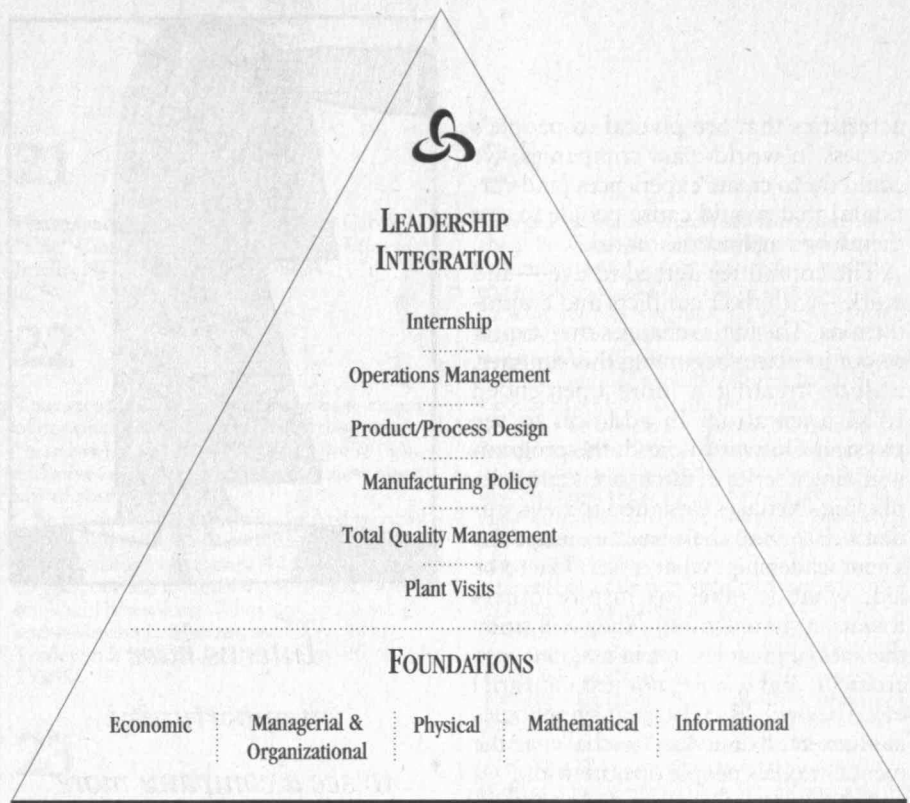


His overview of the supply chain in Kodak's roll-coating division led him to recommend increasing inventory at certain points of the process, a judgment call that increased short-term costs for certain managers. Through a pilot study, however, Hetzel showed that his strategy saved money overall and increased the division's ability to respond quickly to the needs of customers.

LFM interns are not just learning, they are producing, agrees Ralph Larsen, CEO at Johnson & Johnson, which has added eight LFM graduates to its permanent payroll to date. Larsen notes that during an internship, Mano Chinnaswamy, SM '92, worked on a new process for tablet coating and printing. Chinnaswamy's team developed a process that saved the company \$2 million annually. J&J's experience was not unique: according to figures gathered by LFM from its corporate sponsors, the 125 students who have completed their internships, working with on-site staff and LFM faculty, have generated short-term savings in excess of \$28 million.

The determination of LFM students to function as change agents in organizations in which they find themselves has been demonstrated close to home. Students acknowledge that the program conveys a message that "it's okay to question what we do at LFM." Nevertheless, administrators and faculty were surprised in April 1992, when Michael Blatz and Jeffrey Wilke, both SM '93, took their "continuous improvement" training to heart and drafted a letter asking MIT to put the "leadership" back at the forefront of Leaders for Manufacturing. Although strengthening the leadership component had been a continual topic of discussion, this letter was, in the memory of one faculty member, "a rocket shot across the bow that got everyone's attention."

The program's familiar "pyramid" chart embodies the notion that leadership skills will emerge as the students approach the apex of their technical and managerial training. But Blatz and Wilke



*The pyramid diagram used by LFM organizers to express the many facets of the program was found by students to be flawed: leadership is mentioned only at the top, suggesting it is the culmination of their education. They pushed to have the nurturing of leadership included as well at the base of the pyramid—the foundation, as one put it, "of everything we do."*

argued for a more direct approach. They recruited representatives from the corporate sponsors, faculty, and program administration and met to hash things out. "To the credit of the administration," Wilke says, "[students] were treated as equals."

Faculty member Robert Thomas recalls the first meeting as "a verbal donnybrook," where the players found that they all approached leadership from completely different perspectives. Was leadership about motivating others, a set of practical skills that could be accomplished through a "Dale Carnegie approach" and workshops in public speaking? Was it simply rising to a very high level of management responsibility and executing tasks skillfully? Or was leadership a world view, a combination

of technical and managerial understanding, ethics, and the ability to create a certain kind of environment that supported and could capitalize on change?

"Some of us thought leadership was developmental, that you plugged people into a teaching machine and out would come a visionary leader," Thomas recalls. "Others, and I was in this camp, thought that we had to define the vision first." Kodak executive David Groff, who had done a study of how major corporations foster leadership and plan for succession within the ranks of their managers, says that no one on the nascent committee expected to come up with "the 10 commandments of leadership." But the industrial participants did believe, he says, that "if we got more focus, if we could articulate certain char-



acteristics that are pivotal to people's success in world-class companies, we could try to create experiences [and curricula] that would cause people to test themselves against the model."

The committee agreed to live—and work—with their conflicts and contradictions. The initial changes they expect to put in place, beginning this summer, include creating a more open-ended LFM orientation. In addition to the physical Outward Bound, the program is adding a series of discussions and role-playing exercises designed to help students delve into their basic assumptions about leadership: what it feels like to be led, what it takes to inspire others toward a shared vision. They will study the lives of great leaders in religion, government, and science, not just industrial life. They will listen to great symphonies in an exercise designed "to challenge the mental models people operate with."

There are also plans to have some of LFM's industrial sponsors develop in-class leadership workshops instead of limiting their direct involvement to the internship period. And, since personal networks help to cultivate and sustain leadership, it was suggested that the second-year class act as mentors to the first year. This kind of "Big Brother, Big Sister" arrangement is seen as a way to reduce the stress of the first year while expanding the range of contacts students will take into their professional lives.

The on-going leadership initiative has made it clear that changing technical and organizational challenges call for a willingness to set off into the unknown. "We want to imbue LFM with that sense of discovery, so that when the graduates take on their jobs they can succeed as both practitioners and thought leaders," says John Matson, a vice-president at Johnson & Johnson.

"Our central tenet was that leadership cannot be taught, but it can be learned," says Jeffrey Wilke. "We want students to come into the program at one level and move on, so that when they leave, they will have enhanced their natural leadership abilities. Leadership won't be



*Interns have  
an opportunity  
to see a company more  
objectively than  
insiders and in more  
depth than  
consultants.*



the top of the pyramid; it needs to be the foundation of everything we do."

In the present global situation, many of the largest corporations—the ones traditionally most impervious to ups and downs in the market—are the most threatened. That includes a majority of the program's corporate sponsors—companies such as Boeing, Chrysler, Digital, Ford, GM, Polaroid, and United Technologies. Their dominance in their respective markets has been shaken. If LFM graduates are to contribute anything to improving the situation, they

will have to do more than simply implement Japanese total quality management techniques and process simulations—as valuable as these may be.

Students say that in their experience, the corporate managers associated with LFM are honest about the shortcomings of their organizations. William Hetzel points out that most corporations have some divisions that are performing well, and management is eager to take lessons learned in their best units and seed them throughout the company.

"Only by exposing your weaknesses can you learn, and only by learning can you improve," agrees Stephen Chong. "It's a saying that rolls off the tongue of everyone associated with LFM." Chong says that the flip side of the problems faced by his sponsor, GM, are the enhanced opportunities to make improvements. "If I want to make an impact on manufacturing—and I do—a company like GM is the place to do it."

Exposure to other companies has given Ann Robinson a greater appreciation for her employer, Johnson & Johnson. She notes that, "J & J may be fat and happy now, but there's no guarantee that this will last. Doing well now doesn't mean that it shouldn't be concerned about making changes in its manufacturing processes for the long term."

"Nobody, alone, has the right answer," says James Lawton, who went to work at Hewlett-Packard after he graduated. "All of the parties come to the table recognizing that they have to come up with the answer together." And Jeff Wilke, who fought for increasing the LFM leadership component, interrupts the end of his interview to ask, "Did you notice how many times I used the word 'I'? Not very often. It used to be that 'what can I achieve as an individual' was the most important thing. Now it's 'what can we achieve as a group.' Leadership means that it's okay for 'we' to be the most important word."□

*DEBRA CASH is a Technology Review contributing writer.*





## 17

Han Ho Huang's daughter has informed us that her father passed away peacefully at age 99 last January in Palo Alto, Calif. He had made his home there since returning to this country from Shanghai, China, in 1966. A graduate of mining engineering in 1917, he was, according to my old Alumni Registers, on a university faculty at least some of the years he resided in Shanghai.—Donald Severance, acting secretary, 39 Hampshire Rd., Wellesley, MA 02181

## 18

Please send news for this column to: Max Seltzer, secretary, 365 Central Ave., Needham, MA 02192

## 19

### 75th Reunion

Recently in preparing notes for the Class of 1919 to appear in the *Technology Review*, I have tried to make contacts with classmates by telephone. It has not worked out well, as you will see by the notes for this issue. A lot of the difficulty is my poor hearing so I will try another route for the next issue.

I did get in touch with Donald Way, our class president, and his wife. I found he is recently back from a six-day hospital visit first thought to be for a heart attack and, if I am correct, it turned out otherwise. At any rate he is home again. Our conversation was not the best but I enjoyed talking with Don and Barbara. So I can report a good conversation.

I later called Bob MacMullin and his good wife and we didn't do so well. I found them at home, and it was good to hear their voices. I am sure they are busy as usual.

One of our classmates, George Michelson, lives near enough to the Institute to get closer to things and people. Apparently he was not at his home when I called, and I had to write to him instead. George is interested in our class and has been very helpful to me.

I got a nice long letter from Doc Flynn after our last conversation. He and his wife Erma, are always interested in our class and I enjoy talking with them. More of this next time around.

So my dear classmates I hope better weather visits some of us soon, and I will try to send you better notes.—W.O. Langille, secretary, P.O. Box 144, Gladstone, NJ 07934

## 20

Please send news for this column to: Harold Bugbee, secretary, 313 Country Club Heights, Woburn, MA 01801

## 21

Please send news for this column to: Carole "Cac" Clarke, president, 608 Union Ln., Brielle, NJ 08730, (201) 528-8881

## 22

Your secretary has received no news from any of our classmates. At this stage of the game, "no news is good news." It means we're "all still alive and kicking." Do let me know about any of your "kickings."

As for me, I still swim, hike, and write every day. My eleventh book is entitled, *The Student Conservation Association: A Living History*. At 93 plus, one has a collaborator to make sure the book will be finished. What a lucky duck I am!—Martha E. Munzer, secretary, 4411 Tradewinds Ave. E., Lauderdale-by-the-Sea, FL 33308

## 23

Please send news for this column to: Frederick Almquist, secretary, 19 Griswold Rd., Wethersfield, CT 06109

## 24

### 70th Reunion

Mrs. Hope Brown, sister of Gardner MacPherson, sent an obituary of her brother. He died January 26, 1993, of a stroke in his home in Castine, Maine. Gardner MacPherson was a retired official of the Central Intelligence Agency. He was born in Boston. Before World War II, he worked for Brown Brothers Harriman, investment bankers in New York and Berlin. During the war, he worked for the Office of Strategic Services, the predecessor agency of the CIA, in Portugal. Later, he worked for the CIA in Paris and in senior financial positions in Washington. Gardner played golf and enjoyed bridge. He also enjoyed photographing European cathedrals.

A friendly letter from Dick Shea tells how close they were (a few hundred miles!) to Hurricane Andrew. That should have kept them alert. He also mentioned that they had been up to visit two daughters in New York State last fall. Unfortunately, both he and Louise contracted bronchitis and were still trying to recover, hoping the Florida warmth would take care of that.

Dick reminded me that the reunion is coming this summer. I am planning to bring my traveling buddy to the reunion and hope to get acquainted with many of you.—Co-secretaries: Katty Hereford, Box 5297, Carmel, CA 93921; Col. I. Henry Stern, 2840 S. Ocean, #514, Palm Beach, FL 33480

## 25

George P. Palo, '28, kindly sends us material about Professor Jiayang Shi. We are greatly indebted to him. George met Shi on a business trip to China in 1980 and since that time has exchanged notes with him. Shi visited George in Knoxville, Tenn., in 1981. Following graduation in 1925, Shi did graduate work at the Institute and obtained a masters degree in 1928. George wrote him last fall indicating that Shi would be welcomed at Class of 1928's 65th Reunion in June 1993. Shi replied, noting that he had observed his 90th birthday last September. "It seems better for me to wait until 1995, my 70th graduation year, Course II. Probably, the classmates I meet at that time will have all exceeded 90 years."

George recently received a package from Shi containing a paperbound book of 185 pages—105 in Chinese, 45 in English, and 35 in Russian, *Selected Essays of Jiayang Shi*. The parts in English are all on China's multipurpose water development. The book also contains photos of Jiayang and family members. One has him on a tennis court in 1990. He and his wife, Wen Zhen, are a charming couple. His address is Professor Jiayang Shi, 37 Sheng Yin Yuan, Tsing Hua University, Beijing, P.R.C.—F. Leroy Foster, secretary, 434 Old Corners Rd., P.O. Box 331, North Chatham, MA 02650

## 26

Leo Teplow writes that the growth and emphasis on the humanities at MIT continues to amaze and please him. "Back in the 1920s the Institute was strictly technical (except for architecture)," he says.

John R. Kimberly of Easton, Md., died December 20, 1992. He was the former chair and CEO of the Kimberly Clark Corp. and the grandson of John A. Kimberly, one of its founders. The company makes Kleenex, Huggies disposable diapers, and Kotex feminine napkins, as well as other paper products. John retired in 1968, but remained a director until 1977. That year the company established the John R. Kimberly Distinguished Professorship at the American Economic System at Lawrence University in Appleton, Wis. During World War II John was deputy director of the War Production Board. He is survived by his wife, the former Anne Jones Morton, three sons, thirteen grandchildren, and six great-grandchildren.

Dudley L. Parsons of Tucson, Ariz., died January 12, 1993. He is survived by a daughter, a son, and four grandchildren. . . . John W. Searles of Plymouth, Mass., died January 17, 1993. Upon graduation from MIT he moved to Plymouth and became associated with the Plymouth Cordage Co. He served in Washington, D.C., as a major in the U.S. Army during World



War II and was an active Mason for many years. He is survived by three children, ten grandchildren, and four great-grandchildren.

**Chenery Salmon** of Newtown, Pa., writes that it's always pleasant to open the *Review* and find a commentary from some classmates who are still around. "We are in a Life Care community, which takes such good care of us. Life, to a huge degree, is what one makes it. The food is very good and well served. There are ample mental and physical programs to maintain alertness and much to keep us learning."

Thanks for writing Chenery—now let's hear from some more of you. Please send news to—**Donald S. Cunningham**, secretary, Eventide, 215 Adams St., Quincy, MA 02169, (617) 328-1840

## 27

Last June at our Annual Luncheon it was announced that our class had contributed the largest financial donation of any 65th Reunion. In February the supplement to *Technology Review* listed 52 names of the classmates, wives, and widows who contributed from our present class of about 150. These men and women have remembered, after 65 years, how much their studies at MIT have contributed to their knowledge and horizons throughout life. They respect the Institute, its accomplishments, and its reputation as a top-notch teaching and research organization.

When we see our Class Notes in front of 40 pages of other Class Notes, we can realize the thousands of men and women who have followed us in their lives of accomplishment. It gives each of us a sense of pride in being an alumnus. So now in our later years, we can take even more pride in being a member of the Class of 1927.

**Edward J. McCabe** of Cambridge, Mass., died on November 23, 1992. In August 1927, he began work as an engineer assistant with the Mass. Dept. of Public Works and accepted a permanent position in 1930. His assignments included work on the construction of Route 3 to Cape Cod, the Worcester Turnpike, the Transport and Planning Division, and the Layout Division. He retired in 1972 after 45 years of continuous service. Edward was a member of St. Peter's Parish St. Vincent de Paul Society for over 55 years and was president when he died.

**Arthur O. Gormley** of Fairfax, Va., died May 26, 1992. We regret we have no information on his life. . . . **Lincoln K. Davis** of South Easton, Mass., died December 24, 1992. He graduated from Dartmouth in 1925 prior to attending MIT and became a registered professional engineer. He was active in the radio business and later in a variety of research and engineering projects. During World War II he worked in the Harvard Underwater Sound Laboratories. He then joined the Foxboro Co., from which he retired in 1970 after 25 years. Lincoln held about 25 patents and was a life member of the American Society of Mechanical Engineers. He was also a member of the Commercial Club, where he bowled for 48 years, and the Pine Oakes Country Club. He was a director of the Colonial Brass Co. in Middleboro, Mass., and the Berwick Boys' Foundation, and became a trustee of the Pilgrim Foundation.

**E. Robert DeLuccia** of Lake Oswego, Ore., died December 17, 1992, of congestive heart failure. As he graduated in civil engineering, little did he foresee that he would become an eminent hydraulic power engineer. He joined the Federal Power Commission in 1935 and the Army Corps of Engineers in 1942. During

World War II, he served on General Eisenhower's headquarters' staff and received the Legion of Merit Award. Robert joined Pacific Power and Light Co. in 1951 and a year later was named VP and chief engineer. He became senior VP in 1966 and retired in 1969.

During his career, Robert served as a U.S. delegate to several international conferences, including a World Power Conference in England in 1950. He was the principal negotiator for the 1949 treaty with Canada for the division of water at Niagara Falls. He was named Oregon Engineer of the Year in 1952. In 1963 he received the Goethals Medal Award from the Society of Military Engineers, and the Watzek Award from Lewis & Clark College in 1986. Bob was a loyal MIT classmate, and he and his wife Margaret enjoyed our 65th Reunion last June.

We send our condolences to the wives and families of these classmates.—**Joseph C. Burley**, secretary, 1 Harbourside Dr., Delray Beach, FL 33483; **Lawrence B. Grew**, assistant secretary, 21 Yowago Ave., Branford, CT 06405

## 28

As you read this, our 65th Reunion is in the past, for better or worse. However highlights and statistics will be reported in the October issue because of the *Review's* deadline schedule. At the moment there is a complete dearth of class news, perhaps due to the recent widespread impact of nationwide winter "storms of the century." However, we hope that many of you will have equally impressive memories or knowledge of the reunion and have taken a deep breath in preparation for our remaining class years.

**Warren Greenlaw Jr.**, of Marblehead, Mass., retired businessman and avid sailor, died January 5, 1993. He was owner and president of Store Planning Associates of Boston for more than 20 years. He also established the Greenlaw Fixtures, Inc., in the early 1950s and maintained the business for 15 years.

Your cooperation is requested in keeping each of us survivors informed of your thoughts and activities, mundane though they may be compared to our illustrious past. I promise a personal reply, perhaps a "lost and found" service.—**Ernest H. Knight**, secretary, Box 98, Raymond, ME 04071

## 29

A brief note comes from **Adrian N. Clark** and wife, Hope: "I am still singing in the church choir and I drive ill people to and from the doctor's offices." . . . **Paul S. Baker** of Williamsburg, Va., writes that his wife passed away. Last November and December he traveled to Antarctica. . . . **J. Wesley Walthers** and wife, Josephine of St. Paul, Minn., "were in a car accident last March. My wife suffered six broken ribs. Fortunately, she has had no further complications. Our best wishes to all our classmates. We will be celebrating our 64th wedding anniversary in June 1993."

**Chung F. Yee** (wife, Zai-Chen) of Worcester, Mass., writes that he had a cataract operation in November. "My vision is getting better. The doctor tells me that it will take a few more weeks for complete recovery." . . . **William W. Saunders** and wife, Patricia, who moved from Naples to Hendersonville, N.C., designed a house and had it built three years ago. "I enjoyed the project so much that I improved

upon the design, and built another. I moved into it July 1991." Bill also had cataract surgery "with excellent results. I also have had my both knees replaced, plus other corrections. From now on it is Patch! Patch! and Patch!" Bill and I were both in Course XVII, building construction engineering, from which he used his knowledge and training.

**Dr. John Happel** and wife, Dorothy, of Hastings-on-Hudson, N.Y., send news that they spent the winter "mostly in New York, though we had a brief vacation in Puerto Rico. Doty has skin problems and a good sunburn seems to be the best way to keep psoriasis under control. We hope to go to Barbados." Doty's music keeps them in New York. She played in Handel's *Messiah* last season. "I have still been active at Columbia with our little research company with one of my former doctoral students. Probably, I will stop driving nights as the glare of traffic lights bothers my eyes. Our youngest daughter got married last March and is living in North Carolina. She is interested in music recording and just made a video about the Amazon rain forest."

I regret to announce the deaths of the following members: **William J. Wiley**, December 18, 1990; **Alfred H. Hayes**, March 10, 1991; **James Cooper**, May 25, 1992; **Edward B. Papenfus**, June 5, 1992; and **William H. Lerner**, on January 17, 1993.

**Cooper** graduated from MIT in electrical engineering. He was a retired merchant residing in Brockton, Mass., who was the owner of Adams 5 & 10, opened in 1935. His philanthropic and community service was noted in many areas. He received the McKeon Post Citizenship Award for outstanding community service. In 1950 he was president of the Brotherhood of Temple Beth Hillel in Dorchester and president and chairman of the board of the temple from 1953–1955. Cooper served as chairman of a Hebrew school and the Combined Jewish Philanthropies of Greater Boston. He was honored by the Jewish Theological Seminary of America for outstanding service and was the recipient of many other awards of recognition of his service to the Jewish community.

**Cooper** was founder and first president of Randolph Friendly Seniors. He worked in the Brockton courts with children of divorced couples. For more than 15 years, he worked with handicapped children at the Massachusetts Hospital School in Canton. Until his death, he tutored third grade students in mathematics in Brockton. In addition to his wife, Bessie, he leaves a son, a daughter, a brother and sister, four grandchildren, and nine great-grandchildren.

Also in a letter, a descendant of **Edward B. Papenfus** wrote: "Until recently, he always maintained his interest in MIT. In spite of the boredom of living in Canada, he was a brilliant man."—**Karnig S. Dinjian**, secretary, P.O. Box 83, Arlington, MA 02174, (617) 643-8364

## 30

This month, for the first time in many a moon, we have an oversupply of items for the Notes for two reasons: the use of an expanded mailing list, and the receipt of an unusually large number of notices of classmate's deaths. When I first became secretary in 1960, I received a set of 700 index cards bearing the names of about 450 SB recipients and about 250 graduate students and other students who, for a variety of reasons, failed to qualify for a SB degree in 1930. My "working" list has comprised the



1930 SB recipients plus those who have shown a continuing interest in class affairs by attending reunions or volunteering information about their activities. Early this year, in part because of our dwindling numbers, I decided to solicit information from non-undergraduate degree holders and have received a gratifying number of responses that I plan to spread over the next several months. In this group is **Bob Asbury** who received a SB degree from Brown in 1928 and an MS in Course X from MIT in 1930. From 1930-37 he worked in the Coal Research Laboratory at Carnegie Institute of Technology, during which period he wrote a number of papers on solvent extraction of bituminous coal. For most of his career he did research and development for Ethyl Corp., first in Detroit. From 1940 until his 1969 retirement he worked for them in Baton Rouge, La., where he and his wife, Elsie, now live. He is a past chairman of the local ACS chapter. The Asburys have a daughter, Carolyn Goetzman, and three grandchildren.

**Egi Fasce** also lives in Baton Rouge. He received a BA degree from Williams in 1923 and after which he worked as a lab assistant and research associate at MIT to finance his graduate work. In 1928-29 he was the DuPont Fellow in the Department of Chemistry, from which he received a PhD. For most of his career (37 years) he did petrochemical research and development work for Esso. He is inventor or co-inventor on 26 U.S. patents and numerous foreign patents. As a retired AUS Lt. Col., he has long been active in the Military Order of the World Wars, serving successively as a local, state, and regional commander, as well as a member of the MOWW General Staff. He has also been active in Kiwanis, notably as president of the Louisiana-Mississippi area. Egi and his wife, Sarah, have two daughters.

I turn now to the seven notices that have come in concerning classmates' deaths. Several years ago I received a note from **Bob Foster's** wife, Mary Ann, telling me that, like an increasing number of our classmates, he had become a victim of Alzheimer's disease and entered a nursing home in May 1989. **Hal Spaans**, a long-time friend, has now passed along the news that Bob died in January 1992. He was for many years the owner of a construction business in Concord, N.H., first as a builder and later as a consultant. He was quite active in community affairs, having been treasurer of Merrimac County, trustee of Concord Hospital and chairman of its building committee, chairman of the city building code board of appeals, and president of the Concord Rotary Club. Hal, in his note, recalls the fact that he and Bob made their first airplane flight together in December 1927 in an open biplane equipped with skis; it was "quite an experience." My records indicate that, in addition to Mary Ann, Bob is survived by a daughter Karen. . . . **Bob Nelson's** death last September was reported by his daughter Diane Pravikoff. In recent years he had lived in Glendale, Calif., where under the name Robert Nelson Associates he designed special items of office and shop equipment for some of the large manufacturers in that area. As of 1974 his two sons, Robert Jr. and Stephen, were both involved in the Navy's nuclear reactor program, reporting to Admiral Rickover. My five-year-old record indicates he had seven grandchildren.

**Don Harrison**, who died December 12, graduated from Yale in the class of '29 with a degree in chemical engineering. He then enrolled in the Practice School at MIT, which led to an SM degree in 1930. He joined the Union Carbide Patent Department in 1931 and remained there for 37 years. In the last 25 years he headed the

department and was general patent counsel. In 1969 he and his wife, Mary, retired to Roxbury, Conn., where he served on the Democratic Town Committee, the Zoning Board of Appeals, and the Planning Commission. Don was an amateur painter and was active in the Washington (Conn.) Art Association, an organization he served as president of from 1976 to 1980. In addition to Mary, to whom he was married for 61 years, he is survived by a daughter, Margaret, a son, John, SM '83, and four grandchildren. . . . As reported in the October '92 Notes, **Biagio Alfred (Bevo) Carideo** had a massive stroke in August 1991 that made necessary his move to a nursing home. We now have a notice that he died on December 13, 1992. Bevo was a longtime resident of Natick, Mass. After graduating from MIT as a civil engineer, he worked in the Boston Park Department until he entered the army in 1940 where he attained the rank of lieutenant colonel. After his military service he worked as a design engineer at the U.S. Army Quartermaster Research and Development Center in Natick until his retirement in 1974. He is survived by his wife, Eva (Nicolotti) Carideo.

**Bill Lodge** died in Dobbs Ferry, N.Y., on January 5. He was a longtime employee of the CBS radio and television networks. He had been in declining health since he suffered a stroke in 1981. After graduating in Course 6A, he joined CBS as an engineering assistant and rose to be director of radio engineering in 1937 and VP of engineering in 1949. With the advent of television, he was promoted to VP of engineering for the CBS television network in 1952 and became VP of affiliate relations and engineering in 1957. Among the developments Bill supervised were high-quality taping technology that enabled delayed broadcasts to the West Coast, the change from black-and-white to color, and the introduction of microwave relays. He was involved in the debates over allocation of UHF and VHF frequencies and the North American treaty to prevent conflicting radio signals among neighboring nations. His impressive list of titles included director of the National Association of Broadcasters, fellow and past governor of the Society of Motion Picture and Television Engineers, and Fellow of the Institute of Radio Engineers. After his retirement in 1971, he and his wife, Margaret, built a home in St. Croix, V.I., where they spent the winter months, retaining the Dobbs Ferry house as a summer home.

**Bob Cook**, who died January 12, attended Northwestern University and received a degree in architecture from MIT in 1930. In the early years after leaving MIT, he worked under Louis Skidmore on the design of buildings for the Century of Progress Exposition, the Texas Centennial Central Exposition, and the Petroleum Industries Exhibit at the New York World's Fair. Later he worked for Virginia Metal Products, an Orange, Va., manufacturer of metal partitions for commercial buildings and book stacks for libraries, in several different capacities—manager of product planning, national sales manager, and director of engineering. From 1960 to 1983 he worked as an architect

with Bailey & Gardner in Orange, specializing in library design. He was a director of the James Madison Memorial Museum and of the Rotary Club in Orange, as well as a compliance inspector for the Veterans Administration on homes financed by the VA. He is survived by his wife, Frances Smith Cook, three sons, and three grandchildren.

In the July 1992 Notes we reported that **Harold Brown**, another Alzheimer's victim, had been in a nursing home for about two years. We have now received a note from his daughter-in-law Dorothy that he died peacefully in his sleep on January 21. As previously reported, after doing graduate work at Columbia, Harold worked with two radio and television pioneers, Allen B. DuMont and William P. Lear. He invented the "Q" vibrator, manufactured by P.R. Mallory & Co., that made possible the widespread use of car radios in the late '30s. He later worked for the Aerovox Co. in New Bedford, Mass., the Naval Avionics Facility in Indianapolis, and the Lorain Products Co. of Lorain, Ohio, until his retirement in 1987 and was the owner of almost 50 U.S. Patents. He is survived by two sons, five grandchildren, and one great-grandchild.—**Gordon K. Lister**, secretary, 294-B Heritage Village, Southbury, CT 06488

## 31

Please send news for this column to: **Wyman P. Boynton**, secretary, 668 Middle St., Portsmouth, NH 03801, (603) 436-1309

## 32

We received a nice letter from **Louis E. Jones**. He and his wife, Mary-Ruth, celebrated their 60th wedding anniversary. He finished his professional career as assistant to the president of a subsidiary of Acme Steel. Louis has led a very active life. Let me quote directly from his letter.



**Louis & Mary-Ruth Jones at their 60th wedding anniversary (capped by the Orioles and the Cardinals).**

"We have been very lucky healthwise compared with other people of our age; both 84, exercising almost every day. Lots of traveling and many other cultural interests have helped keep us very active and alert. We moved here (Richmond, Ind.) from the Chicago area just five years ago. We have independent housing in a large retirement complex, which provides four or five levels of care. Since moving here we



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have traveled to Japan, Mexico, England, Honduras, and British Columbia, Canada.

"...I have been deeply interested in history and genealogy and have published eight books. I try to promote world peace by sending out 600 quarterly *World Peacemaking Newsletters*. ... We were very sorry not to have been able to go to the MIT 60th Class Reunion because of an important visitor from England and a surprise 60th wedding anniversary planned by our three children, ten grandchildren, and two great-grandchildren. Over the years we have maintained a very close relationship with them all, so we had a grand time and lots of fun for all." Congratulations. Keep us informed of your continued success in active longevity.

Our president, **John Brown**, has received a diamond pin from the American Institute of Chemical Engineering at a meeting for his 50 years of active membership. ... **Russell Robinson** is putting together a plan for a mini-reunion for 1994 to take place in Tucson, Ariz. More about his suggestions at a later date. ... **Beri Tashjian**, '33, sends obituary information concerning his life-long dear friend **Thomas Amirian** who died in January 1993. Amirian was a structural engineer who was responsible for the building of many New England landmarks, including the central building of the Museum of Science in Boston. He also designed the Wright Brothers wind tunnel and the Hydrodynamics Laboratory Building on the MIT Campus. After a full and distinguished career, he retired in 1983. He was well known as a historian, published many articles on Armenian history, and coordinated lecture series on Armenian history and culture for the University of Maine. Amirian is survived by his wife, Marguerite, a son, and two brothers.

We have the sad news that **Albert King** died in November 1992. He was a retired electronic and chemical engineer. He is survived by his wife, Phyllis, a son, and two daughters. ... **Mildred Cohen** writes us that her husband **Leon Cohen** died just before his 83rd birthday at Pompano, Fla.—**Melvin Castleman**, secretary, 163 Beach Bluff Ave., Swampscott, MA 01907

## 33

Please send news for this column to: **Bill Klee**, secretary, P.O. Box 7725, Hilton Head Island, SC 29938

## 34

### 60th Reunion

I have just learned of **Bob Franklin's** death. For many years Bob served as secretary of our class. His wide acquaintance with his classmates enabled him to provide us with news we were interested in. The secretary of the class is a key person in keeping us all in touch with friends we shared our undergraduate days with. Bob handled this post with distinction for a long time. We will miss him. More details about Bob's life will appear in the next issue.

Send in your suggestions for the post of Class Secretary. It requires work but it is a rewarding task.

**Walter Kut** writes that he and Helen are living in Whiting, N.J. He is professor emeritus and retired from Cooper Union. Walter and I worked together on an undergraduate thesis (something about internal engines under Eddie Taylor in aero-engineering). ... In March I visited Esch and Eddie Sylvester who were in Boca Grande, Fla., for several months. Dick Lawrence, '35, and his wife, Liz, joined us. Dick

was manager of the hockey team in our senior year. We had a great time convincing the girls of our great prowess on the ice.

A number of you have told me how much you look forward to reading our class notes. We need your input. Please write to me or George Bull about yourself and any of our classmates.—**John A. Hrones**, president, 9397 Midnight Pass Rd., Apt. #306, Sarasota, FL 34242, (813) 349-2848; **George G. Bull**, assistant secretary, 8100 Connecticut Ave., Chevy Chase, MD 20815

## 35

**Chester Bond** lives with his wife, Dorothy, in Sun City, Calif. He had his quadruple coronary artery bypass in December 1990. In 1992, they traveled to Russia, Scandinavia, and England. **Chet's** latest surgery was at the San Diego Cancer Center a year ago. His son Christopher is a contractor living in Boston following his dad's line of work. Son Tony is an estate manager living in Washington, D.C. His daughter Rosemary lives in the old homestead on Puritan Rd., Swampscott, Mass. ... My church sent a truck down to **Hamilton Dow's** and we relieved him of several large pieces of furniture that contributed to a large \$2,600 sale in the churchyard.

**Louis W. (Bud) Pflanz, Jr.'s**, epic three-page letter arrived just after I mailed in the previous Class Notes. I have pulled out a few salient points but surely wish you could see the entire opus. "As requested, after lazing about for a few years watching the grass grow, I started making latch-hooked rugs to be used as wall hangings as well as long-stitch needlepoint pictures." Wife Gloria put a stop to this as they had run out of wall space. Bud then turned to making large dollhouses from kits and again ran out of space so gave them away to little girls as gifts. He discovered he could buy kits to make villages of six to eight structures. He made five sets in all for his daughters with "the damndest color combinations," explaining that he had no appreciation of colors and could never pick out a tie to go well with his shirt since he had been spoiled by 30 years in the Army, where one always wore the same color tie and shirt. Bud and Gloria arrived in the Tucson, Ariz., area in 1982 with pet dogs that ended up "interred in a beautiful pet cemetery run by a dog-grooming and boarding outfit that also boards cats. When you drive up the tree-lined dirt road to the installation, the first thing you see is a large sign that says 'The Royal Cat House' atop a kennel that houses the cats." Bud says his younger daughter, Pamela, has three Ragdoll cats, a very rare breed. His daughter Nancy has dozens of birds in a huge aviary: parrots, macaws, cockatoos, and canaries. "Son David finally blessed me with two grandchildren," a boy, age 5, and a 3-year-old girl. If any of our '35ers know of a manufacturer of scale model kits of western-type wagons, please give Bud a call at (602) 378-3460.

Received a card from **Lester Brooks** and wife who were vacationing in Curacao and enjoying warm ocean breezes. ... **Walter Stockmayer** and Sylvia took a three-day opera tour in New York City hearing *Tales of Hoffmann*, *Der Rosenkavalier*, and *Die Meister Singer*. Looking over the tour members, they spied the name Mrs. Stanley M. (Mildred) Lane. When they met, they soon found out she was the widow of our classmate **Stan Lane**, who passed away in 1983. She now spends the winters in Boca Raton, Fla., and summers in Andover, Mass.

Our Class President **John F. Taplin** called to be sure I did not miss Page 22 of the *Review*



*Supplement of MIT/Alumni/ae Activities, 1991-1992.* "The Class of 1935 had the highest non-reunion class participation with 59 percent of its members making gifts in the 1992 Fund." No other class has come close to the 95 percent participation we reached in our 50th Reunion Gift in 1985. (Page 13, incidentally, had a picture of the Lobdell Award winners for 1991, including your secretary.) John had just returned from a 14-day trip up the Amazon, going 1,100 miles to Manaus, Brazil.

I am sorry to report the death of **Harry W. Ruane** at his home in Nashua, N.H., on January 22, 1993. He had been a resident of Nashua for the past 25 years and was retired from Raytheon Corp. in Bedford, Mass. He is survived by his wife, Isabelle; a son, Douglas; a daughter, Emily Hall; eight grandchildren; and four great-grandchildren. I am sending our condolences to the family.

I would like to hear from any of you who experienced the mother of all hurricanes or had near misses.—**Allan Q. Mowatt**, secretary, 715 N. Broadway #257, Escondido, CA 92025, (619) 432-6446

## 36

A glance at the "Other Alum Giving" column on page 89 of the 1991-92 Alumni/ae Fund Report prompted questions to Joe Collins, managing director: "How come \$2,819,748 for our class, versus zilch in the two previous years and \$229,475 in 1989?" The answer: Wheels within wheels, or rather, largesse in large buckets. "Other" includes bequests and the excess of any current individual gifts above \$50,000. Such segregations from "Gifts in Alum Fund" avoid a yo-yo effect therein. Our \$2 million-eight included the seven-digit proceeds of **Frank Schoettler's** will (see July '91 Notes) and "small" six-digit gifts from **Roger Krey** and **Bill Mullen**. Bill has been in the Sustaining Fellows Life Members group for several years, and Roger will be added. **Julian Rifkin** moved to the list this year, a trend compensating for deceased donors. Gifts from graduate classmates are listed by course, not by class, and **Bill Hewlett**, **Bill Rousseau**, and **Ed Nicholson** have been there for years. Are there others I don't know?

But you don't need great wealth to join this group—\$25,000 does it—and to quote Roger, "Everyone is a winner—Barbara and I with new income for our lifetimes, and the Institute when the capital passes to it." So if your natural heirs are provided for, or need no help from you, give Joe Collins a call at (617) 253-8210. He will be glad to explain the Income Fund arrangements. Roger's gift honored C. Fayette Taylor, his 1936 professor in Course II. On learning of this, "Fay" and wife, Alice, entertained Roger and Barbara at lunch, and presented them with Taylor's latest two-volume edition on engines—also an illustrated personal history of his transition from the horse age. He is 98!

**Bill Mullen** now heads an informal once-a-month luncheon group in Pasadena, Calif., started in 1975 by Bob Woods, '12, and Col. Philip Schwartz of similar vintage, both deceased. Some 25 alums of all classes are on the list to meet and chin on anything except religion and politics. **Henry Lippitt** once addressed the group about the gas industry.

When **Slim Beckwith** read the February Notes about our classmates' experiences with the Florida and Hawaii hurricanes, there came to his mind the New England hurricane of 1938. Slim was a fledgling meteorologist with United Air Lines, and had "no satellite pictures,

automatic offshore weather stations, or computers. The art of synoptic forecasting came into play, using a few onshore reports, practical experience, and seat-of-the-pants hunches. We missed the time of landfall by six hours, but had to shut down flight operations at Newark—west of the eye—for only three hours. In New England the storm killed 700 people—imagine the loss of life from Hurricane Andrew had we not had the latest technology and communications, and cognizance by the public of peril, thanks to TV." . . . **El Koontz** in Old Saybrook, Conn., was visited by **Gordon Thomas** returning from Quebec to Florida, and on a trip to Marco Island. El saw what marks of the hurricane remain in Gordon's home. El plans to move across the Connecticut River to Old Lyme when he sells his present abode.

A letter from **Eve Odiorne Sullivan** inquires about her father **Richard Odiorne** (Course IX) who died in 1963. She has two sons, one an MIT sophomore, and wants to convey to them what their grandfather experienced in our day. So I put her in touch with **Tony Hittl** and **El Koontz** who worked with Dick on *The Tech*, fellow dinghy sailor **Bob Gillette** and **Alice Kimball** who knew him socially. Any others? . . . In March Alice made her usual camping trip to Edisto Island, S.C., (short, for her) where she saw **Doris and Towers Doggett**. They spend a few winter months there at an RV park, and Doris is noted for hosting parties "at the drop of a hat." Towers has given me much information about their experience with canal boating around England, but we have yet to get back there.

Cheers for the lives of **Karl Gelpke** and **Harry (William H.D.) Shewbridge**! Karl's 1992 note told of "some time at Mass. General" with prostate and other cancer, yet he felt reasonably well until December. Then he had a stroke in January, and he died on the 28th of pneumonia. The report of my visit last summer (November '92 Notes) paid tribute to his career with Kendall Co. and his activities in retirement (see also 50th Biographies). Karl was active in the MIT Club of Rhode Island, and several friends have made contributions to the Institute in his memory. Karl's widow, **Amanda**, continues at 243 Stone Church Rd., Tiverton, RI 02878. . . . **Harry** died February 10, also of pneumonia, after several years with Lou Gehrig disease. He retired as chief industrial engineer of Scoville Manufacturing after 35 years. His wife, **Mary**, has fond memories of meeting him in our senior year and attending Saturday night dances at Walker. They would have reached their 55th anniversary in a few weeks. She continues at 65 Flagler Ave., Cheshire, CT 06410.—**Frank L. Phillips**, secretary, 1105 Calle Catalina, Santa Fe, NM 87501, (505) 988-2745; **James F. Patterson**, assistant secretary, 170 Broadway, Pleasantville, NY 10570, (914) 769-4171

## 37

Glad to find that many of you are keeping your secretaries busy with your letters. **George Hain**, who retired from Cities Service Oil Co. back in 1976, is still working part-time as an electron microscopist for New Mexico State University. Formerly in product development with what is now Mobil, he had spent most of his career in surface chemistry and problems of lubrication friction and wear. . . . **Ed Herbig** of Waterville, Minn., retired from the general sales management of E.F. Johnson Co. and leads a pretty quiet life, except for local politics. Unhappily, much of his time recently has been in the hospital. . . . **Leonard Myers** retired in 1978 from

Eastman Kodak. He won't say exactly what he has been doing, but "almost everything."

**Phil Dreissingacker**, ever alert, reports the unhappy news that **Bill Chandler** has passed away. "Bill was a fraternity brother of mine (ATO) from Oklahoma. He returned to Oklahoma after graduation and got into the oil-well supply business. He and his family attended one of our reunions but were not at our last. This year's Christmas card reported he was suffering from cancer." . . . **Ernie Ferris** retired 12 years ago from the position of VP of engineering at Borg Warner Corp. He lives in Oak Brook, Ill., and busies himself trying to beat the market (just like the rest of his classmates). Lest you think that is all he does, listen to this: "The only physical activities are skiing (on a machine), bowling, and golf, and trips to see my grandchildren in Pennsylvania, Colorado, and Oregon, with a trip to Nantucket for good luck." He received a patent last year on a sprag-type one-way clutch and sold it to his former employer. He misses his old buddies **Brauer**, **Cestoni**, **Ferrary**, **McFee**, and **Zincuk**. Your secretary expects a letter from each of them in response to this challenge.

**Harry Corman**, now of Waterbury, Vt., got out of the construction business and is semi-retired, doing engineering consulting in Vermont. He enjoyed the 55th Reunion "immensely" and hopes to see everybody at the 60th. He still plays tennis, takes sailing lessons, and tries to play the piano, for which he needs "more rhythm," according to his wife, June. They visited **Sidney Mank** on the way south to their winter place in Naples, Fla. Says Harry: "He lives in a small town about 100 miles west of Washington, D.C. He and Dot are doing fine." (Sidney will tell us more when he writes his letter, I hope). . . . **Paul Allen** writes from Pasadena that he is now acting as a mining consultant. In addition to working in his home workshop, he does mountain-climbing and cross-country skiing. He has an exciting trip coming up this summer on a Russian icebreaker as it attempts to circumnavigate Greenland in three weeks.—**Robert H. Thorson**, secretary, 66 Swan Rd., Winchester, MA 01890; **Leonard A. Seder**, assistant secretary, 1010 Waltham St., B342, Lexington, MA 02173

## 38

Ten years ago when we were wondering what to do with the 50th Reunion Gift we were going to raise, we had the bright idea of establishing a Class of 1938 Scholarship Fund, with which President Gray heartily concurred. Upon investigation we found that our class officers had had the same idea in 1938, with which then-President Compton had heartily concurred. The only trouble was, it hadn't gotten very far. In the course of five years, because of the class's affluence, its realization that tuition costs have skyrocketed, and its strong desire to repay the Institute for what it has given us, we increased the fund by over 20,000 percent. It's still growing, but it needs to grow more. Nineteen thirty-eight is second among all the class scholarship and financial assistance endowment funds. Let's, like Avis, try harder. A lot of you have pet projects, such as professorships, Independent Residence Development Funds, etc., and a lot of you gave a great deal to the Campaign for the Future, the Margaret Compton Gallery, and the 10-250 restoration. The Scholarship Fund is a small part of what you've given, but please find it in your heart to mark your future annual contributions "Class of 1938 Scholarship fund." Remember also the little glow you get when



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you see yourself listed as a donor to the Century Fund, the Great Dome Associates, the President's Fund, or the Sustaining Fellows.

In previous Class Notes you've read about meetings some of us have had with Class of '38 Fund recipients and about letters we've received. The following from a Class of 1994 recipient summarizes the feelings of all of them:

"I want to thank your class for this tremendous gift of generosity. Without people like you, attending MIT would be impossible for a number of students. I understand that the Class of 1938 has become one of the largest of the class scholarships. This is definitely a tribute to the kindness and generosity of the members of your class. I only hope that one day I will be able to contribute to my class scholarship fund so that more promising students may attend MIT. Once again, I offer heartfelt thanks and a debt of gratitude to the Class of 1938. May your class scholarship continue to help provide an MIT education for many students to come."

We have two deaths to report this month: **John G. Wheale** and **Paul B. Foss**. Information on both is somewhat sketchy. We believe that John worked in sales management at International Silver and that Paul, who got a master's degree in architecture, was a designer of, among other things, the Pru Tower and the MIT boathouse. He semi-retired to Provincetown, Mass., in 1960 to manage family properties. If anyone has further information, please let **Don Severance** know.

This is my swan song as assistant secretary. I've thoroughly enjoyed helping **Harold Strauss**, **Lou Bruneau**, and **Don** over the years whenever they called on me, but it is now time for one of you younger people to take over. I've always wanted to travel and haven't been able to get away since our Panama Canal cruise this February. I hope to have more time for that in the future.—**Ed Hadley**, assistant secretary emeritus; **Don Severance**, secretary, 39 Hampshire Rd., Wellesley, MA 02181

## 39 55th Reunion

Class President **Seymour Sheinkopf** relays from the MIT Student Financial Aid Office that the Class of 1939 Scholarship Fund has \$45,155 available for grants and is assisting eight students. Two of last year's recipients were seniors with impressive grade-point averages and they participate in extra-curricular activities. Also, they work to help defray their expenses. The other six are new recipients. They do well academically and hold leadership positions in all activities including sports and drama. All eight expressed appreciation for the help made possible by generous '39ers.

**Bob Touzalin** and **Aletta** write: "The Naples mini-reunion of '39ers went smoothly. **Wiley Corl**, **Roy Haworth** and **Marge**, **Bill Murphy** and **Anne**, **Bill Pulver** and **Adie**, and **Arthur Porter** and **Patricia** attended. We 11 represented the Class of 1939. **Dodie Casselman** and two other Wellesley '39ers came to lunch one day with **Adie**. Mr. and Mrs. **Paul Gray** were honored guests. **Norm Klivens**, '40, did a fantastic job of planning, staffing, scheduling, and greeting for the overall Naples '39, '40, '41 Classes Reunion. **Phil Stoddard**, '40, and **Lucille Winter** in nearby Fort Meyers and we were happy to reminisce about Phi Kappa Sigma adventures with them. **Bill Pulver**, **Bill Murphy**, and I played golf and we agreed to classify our scores 'confidential.'"

**Bob** and **Aletta** are now preparing for another three-month summer visit to England and canal countries nearby. **Fred Cooke** and **Euge-**

**nia** may share some canal boating. **Seymour** and **Sylvia** expect to be in London this summer and they all may organize a '39er impromptu mini-reunion. In other years, **Bob** and **Aletta** spent 25-plus days at bed-and-breakfast hostels and adjoining pubs; thus they acquired some "hands-on" expertise re the receiving, storing, cooling (?), and serving of England's ales. . . . Other canal travelers are **Art Zeldin** and **Helen**, who went on a cruise through the Panama Canal.

**Richard Donohoe** divides time in retirement between his summer home on Maryland's eastern shore and Washington, D.C., where, as vice-chair of the Executive Committee of the Donohoe Companies, he finds new construction business to be near-bottom in its business cycle. He says awards of new contracts these days are sharply contested. . . . **Dick Leghorn** reports lunching with **Bill McCune**, former CEO of Polaroid Corp. **Bill** is easing into retirement status, where both he and **Dick** can reaffirm the Parkinson Law that activities rise to fill all voids in retirees' so-called free time.

**Fred Grant** and **Ginny** report the 55th Reunion of our class is to start during June Week 1994 at the Marriott Hotel in Newport, R.I.—not at the hotel previously named. So far, the work toward our 55th has been done by **Fred**, **George Beesley**, **Manning Morrill**, **Paul Stanton**, and **Joe Dana**. **Fred** suggests other '39ers who want to share the pre-reunion fun and work can volunteer their interest and availability to him now, and prepare to attend the first meeting of an expanded 55th Reunion Committee in a room at MIT during September-October 1993.

**Jim Barton** and **Mary** flew away just in time on January 19 for a vacation in Hawaii. Next day, heavy rains and gale-force winds in the Pacific Northwest tore shingles from the west-side half of our roof. Our electric power was interrupted for five hours. Some 500,000 other power outages in the area could not be remedied for four days. When they returned from six pleasant sunny weeks on Maui, they were pleased that the storm did no lasting damage to their home on the shore of Lake Washington. After dealing with accumulated mail, they plan travel to Baltimore to renew longtime friendships with **Sid Silber** and **Jean**. **Jim** has a good story about the collision of two snails.

**Fred Schaller** and **Anne** and **Charles Mercer** and **Louise** were pictured in the *MIT Spectrum* as they attended a banquet in the Boston Finale celebration of the successful achievement of all goals for the Campaign for the Future. **Fred** is one of four candidates for election to the Wellesley Board of Public Works, according to a news clipping thoughtfully relayed by **Don Severance**, '38. A handsome four-by-five picture of **Fred** enhanced the article which mentioned topics to be considered including increasing taxes, changing water metering, conserving water, and reducing input of pollutants to the Charles River. Our compliments go to **Fred** and **Anne** for giving of themselves to improve their community. . . . **Leonard Mautner**, **Monarch Cutler**, and **Ted Welten** were mentioned often in **James Gleick's** 532-page book, *Genius, the Life and Science of Richard Feynman*. I read the whole book and recommend it with enthusiasm. Other '39ers whose careers included work in atomic energy include **Warren Evans** and **George Cremer**, both of whom served at Los Alamos, and **Phil Bush**, who headed the Nuclear Energy Division of Kaiser Engineers.

**Bob Sackheim** solves math puzzles such as those in **Allan Gottlieb's** "Puzzle Corner" in the *Technology Review*. . . . **Aaron White** and **Edith** continue extending their library of tapes



and they donated their technical library on metals to Waban's new super library.

**Bob Withington** bought a kit to assemble, in his carport, a two-seater high-wing monoplane with a wingspread of 32 feet and an 80 HP engine. In theory, the plane can be assembled in 500 hours. During assembly phase, the wings fold back, reducing width to eight feet, thus enabling Betsy to park her car in the carport. Modification #1 will be to remove the wheels and tail skid and replace them with floats so that the home for the float plane can be Lake Washington alongside the Withington dock.

**John Alexander** and **Nancy** are members of WAGOBDAI which is a special ski club. On winter Tuesdays, members load skis and selves into a chartered bus that takes them 70 miles to a ski resort on Mt. Rainier. After a full day's fun on the slopes, the members reboard their bus and, on the homeward leg of the trip, adventures of the day flow easily due to prearranged timely lubricants. WAGOBDAI is the acronym for "We Are Growing Older But Don't Admit It."

**Hilda** and I look forward to joining the Alexanders to attend the Evergreen District Barbershop Quartet and Chorus Contest in April. The District includes four Northwestern States and two Canadian Provinces. About 20 choruses and 30 quartets will make six-minute presentations. Three quartets and one chorus will win the privilege of representing the Evergreen District at the International Championship contest during the first week in July when 15 SPEBSQSA Districts will send their champions to sing their harmonies. In Florida, **George Hulst** is active also in barbershopping. He is a member of a District Champion Quartet and he directs a 60-man chorus.

**Joe Dana** and **Jean** and **Bill Pulver** and **Adie** met at Snowmass, Colo., to ski. Three of them were old enough to ride free on the ski tows; however Jean's youth enabled Joe to help enrich the ski tow management. . . . **Roger Bross** writes from Radford, Va.: "... as a registered professional engineer, I continue to work part-time on electromagnetic design and analysis of motors, generators, and similar devices. Also continue to fly airplanes and ride my motorcycle."

**Manning Morrill**, estate secretary of our class, and **Connie** are among leaders in donating to MIT. They volunteer to share their know-how and strategies to optimize net giving to MIT. For details phone Manning at (617) 641-0666.

**John Renshaw** and **Lolita** attended a wedding in the Cayman Islands. Their return trip toward Miami included unscheduled bumps for three hours as the pilot overcame problems caused by a severe tropical storm. Back at work in San Francisco, John specializes in arranging capital formations and speaking at seminars. . . . **Granville Carleton** reports: "I am surviving the rigors of this New England winter and today I'm shoveling like hell! Murphy's Law was imposed today to disable my snowblower and there's lots of snow to be moved today in Beverly, Mass." Before he arrived at the shoveling stage, Gran's career was with General Electric designing engines and their control systems.

**Elihu Root III** uses muscle power to propel his special tricycle and enjoy a wide spectrum of hobbies. He was an early enthusiast in computers and his first personal computer was one with 1,000-byte memory, and he programmed it using machine language. Lately, he is dividing time between hacking and investigating small lithium batteries. Also, he desires to improve design and strength of canes, using lightweight metals and alloys including aluminum, magnesium, and titanium, and he would welcome sug-

gestions from experts in lightweight metals usage. For wide-ranging and stimulating communication, write Elihu at 297 College Hill Rd., Clinton, NY 13323-1208.

**Harold Chestnut** wrote or cowrote six books and served as company-wide consultant within General Electric Corp., primarily in the fields of automatic control and systems engineering for 43 years before retiring. Now Harold and Ruth are active in the SWIIS Foundation he founded, and they travel frequently and far to participate in workshop seminars directed toward encouraging peace on earth.

**Phil Epifano's** career included directing the E and F Construction Corp., builders over the years of major schools, churches, stadiums, and his own beautiful home in Fairfield, Conn. When Hilda and I visited Phil and Martha several years ago, it was a pleasure to enjoy an hour in the Japanese garden portion. At that time, Phil's complaint was that his gardener, taking lunches near the golfish pond, was able to meditate more hours there than Phil and Martha, who owned the pond and its benches. These days Phil and Martha golf during winter months at Pompano, Fla., and summer in Connecticut.

**Dave Frankel** and **Sally** retired to Boca Raton, Fla. They were not adversely affected by Hurricane Andrew. At a recent lunch with **Joe Mazur**, topics of mutual interest included Joe's adventure with heart bypass surgery and Dave's new titanium hip assembly.

**Gus Hunicke**, in bereavement over Prilla, values letters from old friends. Gus, please know your replies generate heart-warming glows.

We are saddened by reports of the deaths of three classmates: **John W. Pocock** in Winnetka, Ill., on October 19, 1992, who was retired from Booz Allen and Hamilton, Inc.; **Meredith C. Wardle**, on March 29, 1992, in Nome, Alaska; and **Allen Monderer** on September 24, 1992, in Denver, Colo. There were no further details.—**Hal Seykota**, secretary, 2853 Claremont Dr., Tacoma, WA 98407

## 40

**Phyllis** and **George Wolfe** had a most unpleasant adventure on February 10 when they found themselves on a Lufthansa flight from Frankfurt to Cairo. Soon after takeoff, they were made aware that the plane was being hijacked! It was turned around in mid-air, flown back to Germany, refueled, and departed for New York. The Airbus was not designed for transatlantic flight, but the skill of the pilot enabled them to cross the ocean safely. Passengers were restricted to their seats, except to visit the lavatory, and there was no food aboard. The stress of not knowing what was next—a bomb, a forced landing at sea, or what might face them on landing at Kennedy—made for several difficult hours. Kennedy Airport had been virtually vacated when they put down, but they were quickly surrounded by SWAT teams, police, FBI, and other officials prepared for a confrontation. The hijacker was immediately subdued (at this writing he is still in jail awaiting trial) and all the passengers were debriefed by the FBI. Thereafter the pilot announced that they would soon depart for Europe, and then on to their original destination of Cairo. George and Phyllis had lost their taste for the whole trip and opted to return to Boston. Upon landing at Logan Airport they were interviewed by a local TV station. The next morning they received telephone calls from many friends and acquaintances who had seen the broadcast. Among them were **Sally (Mrs. Robert) Bitten-**

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bender, Sue (Mrs. Donald) Erb, and Arnie Wight. It will take a long time for the Wolfes to recover from this unforeseen event.

In talking with the Wolfes about their experience, they told me that very recently Sam Rabinowitz had gone to Cairo to visit his daughter and her husband, an official there with the State Department. . . . On a less adventuresome note, John Parnell sent the information from Yardley, Pa., that he had retired in 1983 from Honeywell, Inc., and is now a volunteer examiner for FCC amateur radio licenses. His wife, Sarah, volunteers to deliver Meals on Wheels. He also sent information about the whereabouts of his son and daughter.

From Belmont, Mass., Edgar Bernard wrote, "Since Jeanne has passed on, I am gradually disposing of our collections. I feel I should offer first to our class my Set No. 4 of the Limited Edition of eight Wedgwood 10" dinner plates that was made in 1953. Each plate has a center motif of an important MIT building." If any class members are interested, they may submit a bid—they are in mint condition. . . . Charlie Edwards sent a note from Santa Rosa, Calif., to say, "Meant to send this [the annual Christmas letter] to you earlier. As you can see, I have now joined the club. Now back in the saddle plus doing daily walks. There may be a couple of items worthy of being included in your very well done notes on our class." Charlie's reference is to his cardiac surgery last August. DJ, in addition to becoming computer literate, has run in several road races and done very well. Charlie and DJ had a visit last spring in Detroit with the Walter Helmreich family at the time of a wine-tasting festival. Further travels took the Edwardses to Colorado, Illinois, and Wisconsin.

From Cazenovia, N.Y., Joseph Owens wrote, "I retired five years ago after 50 years in machine-tool distributing. Still do a little consulting, but enjoy golf, tennis, fishing, and making maple syrup, cider, and wine." Joe also enclosed an obituary on Adolph Sebell, who died February 1. The Syracuse, N.Y., *Herald-Journal* ran a long piece on Dolph, a resident of Fayetteville, N.Y. He was president and chair of Syroco Division, Service Industries, as well as president of the parent company, Dart Industries Consumer Products Sector. Dolph was executive director of a business incubator, the Greater Syracuse Chamber of Commerce Business Center. In addition to doing consulting work since 1983, Dolph was a board member of many commercial and charitable organizations. The newspaper includes words of praise from several prominent members of the community. I also received notification of Dolph's passing from his wife, Esta, and from his brother, Norm, MIT '44. The Alumni/ae Association received a generous check from the family in Dolph's memory.

On July 24, 1992, William R. White of Mesa, Ariz., passed away. Bill served in World War II as a naval aviator and then became a TWA pilot. Later, he was an executive in the business world for several years. He leaves his wife, Jai, and seven children. . . . John T. Kirk, Jr., of Short Hills, N.J., died December 14, 1992. John was a merchant mariner during World War II, and was awarded the Enemy Action Ribbon for combat. He spent 40 years with Exxon Corp. and its predecessor companies before retiring in 1978. As a marine engineer, he held various management positions with Exxon, serving at facilities throughout the U.S. and in other countries. He administered and supervised the Naval Architectural staff's designing and converting of tankers for Exxon in the U.S. and Japan. John was a member of several professional and community organizations.

Still another death was that of Dr. Joseph F. Libsch of Bethlehem, Pa. Joe retired in 1983 from Lehigh University as Alcoa Professor Emeritus of Metallurgy and Materials Engineering. He was responsible for the growth of materials science and engineering at Lehigh as one of the premier research and teaching departments in the United States. He served as chair of his department, received many awards for his achievements, and wrote numerous technical articles and papers. He was very active in both professional and charitable societies.

During the mini-reunion in Naples, Fla., the format of the 55th Reunion in 1995 was reevaluated. The consensus was that Woodstock, Vt., would be a better locale than Newport, R.I. Because of the hotel's commitments, it was agreed that the days before the Cambridge events would be the best time to be at Woodstock, with a return to Cambridge in time for the Thursday night Pops concert. As plans develop, I will keep you informed.

Your telephone calls and letters are what provide the material for the column. Keep them coming.—Richard E. Gladstone, secretary, 1208 Greendale Ave., Needham, MA 02192, (617) 449-2421

## 41

Lewis D. Fyske has moved to 623 Princess Court, Tom's River, NJ 08753-5628. He writes, "Please send me info on the MIT Club of Princeton. I'm getting too old for night meetings in NYC, Philadelphia, or Wilmington." Any '41 New Jersey locals take notice!

Edith (Rovner) Corliss writes, "Since retirement from National Bureau of Standards (now National Institute of Standards and Technology), I have done more research on acoustics of musical instruments. Charlie (Charles H. Corliss) has spent most of his time on gardening. We see Gladys (Thompson) Provost, Course I, several times each summer. She lives in Norway, Maine. We summer in Mount Desert, Maine." The Corlisses, both Course VIII graduates, live at 2955 Albemarle St., Washington, DC 2008.

I also received sad news about three classmates: Irv Foote's wife, Eleanor, informs us that he passed away on December 18, 1992. He had been in a nursing home for two and one-half years suffering from Parkinson's disease. According to the biography Irv, a Course II graduate, wrote for our 25th Reunion Yearbook, he was called to active duty on December 1, 1941, after working briefly at Linde Air Products in Newark, N.J. He commanded engineering maintenance units in both Hawaii and Saipan, was promoted to captain, and met and married Captain Eleanor M. Stephens of the Army Nurse Corps in Hawaii. After the war he returned to Linde, shortly thereafter joined the titanium and lithopone operations of the Glidden Co. in Baltimore, Md., and eventually transferred to corporate headquarters in Cleveland, Ohio, as chief engineer. In this and in positions of increasing responsibility including vice-president, he was involved in the manufacturing problems of the 16 Glidden North American plants. Irv's main hobby was boating and he enjoyed many pleasant weekends on Lake Erie with his wife and son Jeff. He also "owned, worked on, and suffered through the ordeals of maintaining almost every popular foreign sports car."

Ralph Wilts died at his home in Boothbay, Maine, on December 21, 1992, of amyotrophic lateral sclerosis, also known as Lou Gehrig disease. Ralph graduated in Course XV and was commissioned a second lieutenant in coast artillery. He reported to Pearl Harbor in June



1941, and was there for the bombing on December 7. Transferring to the Army Air Force, he piloted a B-29 bomber and completed his tour of duty in the Pacific as a captain in 1946. He and Susan Thompson were married in 1947. They moved to Cresskill, N.J., in 1950. Ralph founded and was president of Air Systems Engineering in Hackensack, N.J., after many years in the blower manufacturing industry. He retired in 1987, moving to Boothbay, Maine, where he enjoyed hunting and fishing. He leaves his wife, a sister, three sons, and two daughters.

**Barbara (Eaton) Fisher**, who studied architecture at MIT, died November 11, 1992, in a nursing home in Longmeadow, Mass., near her long-time residence. She was a member of the First Park Memorial Baptist Church in Springfield, Mass., and past president of the Massachusetts Chapter of the Women's Christian Temperance Union. She was also a member of the Squam Lakes Association of New Hampshire, and had been a Cub Scout den mother and Brownie leader. She leaves two sons, a daughter, a brother, a sister, and eight grandchildren.

The class expresses its sympathy to the bereaved families of these classmates.

**Sepp Dietzgen** received a note from **John Sexton**. John is recovering slowly from his stroke of last July and enjoys mail from his classmates.

The spring 1993 issue of *Squaring the Blade*, the newsletter of *Friends of the MIT Crew*, reports \$10,000 in the Charles S. Butt '41 Crew Shell Fund as of December 31, 1992, listing 27 contributors, including 23 classmates. With a reasonable portion of the \$45,000 required for purchase and perpetuation pledged by September, the shell could be ordered and built in time for dedication at a crew race on the Charles next spring. **Chet Hasert** reminds us that we may designate a portion of our annual contributions (hopefully increased) to MIT for this purpose.—**Charles H. King, Jr.**, secretary, 7509 Sebago Rd., Bethesda, MD 20817, (301) 229-445

## 42

My April Class Notes were in error. **Lou Rosenblum** was not editor of *MIT50*, it was edited by **Jack Sheetz**. He not only planned the contents, and created an exemplary multi-node communications network that yielded a far higher percentage return of biographies (than any previous MIT 50th or 25th Reunion Book) but also keyboarded every word except for those in the 60 floppy discs and one e-mail communication. He negotiated the unusually modest cost for printing and binding. Finally, Jack persuaded the Alumni/ae Association to provide the page layout work by **Chris Foglia**.

**Charlie Ruckstuhl** has completely recovered from both his four-way bypass and prostate cancer. He is still running his ham radio on 146 MHz and helping to start the University of Massachusetts/DOT Transportation Institute. . . **Hazel and Fred Gander** winter in Dunedin just a few miles north of here (here being Clearwater!). We play bridge with them and yesterday went to a Phillies spring-training game with the Cards. The Ganders are working hard on learning Italian in anticipation of their visit to Italy this summer. Meantime, Fred is teaching tennis to some of the ladies in their condo!

In March, **Floyd Lyons**, the **Katzensteins**, **Leveres**, and **Krams** attended a black-tie affair in White Plains at which **Bob Greenes** received the Scarsdale Bowl as its "outstanding citizen." Our congratulations to Bob for his many years of service to the community. . . There was a

big article in the *Boston Sunday Globe* about **John Cantlin's** "Multi-Stop" shop work positioning tool almost being pirated by some Taiwanese companies. Fortunately the International Trade Commission was able to intervene and to put an end to the problem.

Two obits: **Karl Baresel** who worked as a chemical engineer for Acushnet Rubber Co. passed away in Stoughton; and **Guillermo Arce** who died in Guadalajara, Mexico. Our condolences to their families.—**Ken Rosett**, secretary, 281 Martling Ave., Tarrytown, NY 10591

## 43

**Leo Fitzpatrick**, **Jim Hoey**, and **Kemp Maples** each forwarded this *Boston Globe* obituary notice. "**Ovide V. Fortier, Jr.** [Course VI], of Falmouth, Mass., died in San Juan, P.R., on February 5 after being hit by an automobile while vacationing on St. Maarten, Netherlands Antilles. Ovide was born and lived most of his life in Brockton, Mass. After graduation from MIT he served as an Army captain in World War II, then worked at Lincoln Lab until his retirement in 1987. In Falmouth he served on the town's cable television commission, helping to establish a cable network linkage between the public schools and the town hall. He also was a consultant to the Woods Hole Oceanographic Institution. His affiliations included St. Patrick's Church in Falmouth, the Woods Hole Folk Music Society, and the IEEE. He is survived by his wife, Geraldine, four children, three sisters, and nine grandchildren." We offer them our condolences.

Other reported deaths are **Dr. Ming Lee** of Kowloon, Hong Kong, on November 27, 1991; **Edward H. McLaughlin, Jr.**, of Los Angeles on November 19, 1992; and **John L. Neal** of Akron, Ohio on December 4, 1992. We mourn the loss of these classmates and extend our sympathies to their families.

On a lighter note, **Bob Miller** has returned to Leesburg, Fla., after a nine-week stint as a volunteer executive with Canara Sell Ltd. in Mangalore, Karnataka State, India. Last year he also vacationed in New Zealand and Costa Rica. He calls retirement a fantastic career. . . The High Pointer organization in California is eagerly soliciting the membership of **Calvin Dunwoody**. Cal qualifies because one of his lifetime goals is to visit the highest elevation in every state of the Union. Alaska's Mt. McKinley at 20,000-plus feet is the ultimate challenge.

**Eduardo F. Herrerias** (Course XB) has sent a résumé—not quite as long as **Virgilio Barco's**, but adequate for the purpose. Upon graduation, Ed spent five years with Shell in the U.S.



**Eduardo Herrerias**

He then returned to his native Guatemala to enter the upper-management levels of wheat milling and flour manufacturing, coffee growing, rubber production and processing, tortilla flour production, banking, insurance, shipping, distribution of consumer electronics products, and grain importing and distribution. Ed has two daughters: one, a certified translator in Guatemala City; the other, a restaurateur in Park City, Utah. In his copious free time, he plays squash and golf, and rows on Lake Atitlan.

This is a kind of limbo for Class Notes. I'm writing them before the reunion, but you will read them after it's all over. I know you can hardly wait for the definitive report.—**Bob Rorschach**, secretary, 2544 S. Norfolk, Tulsa, OK 74114

## 44

### 50th Reunion

On March 1 and 2, the 50th Reunion Committee met again at MIT, along with the Alumni/ae Association, to continue planning for the 50th. **Ed Eaton**, our class president, presided. Considerable progress was made and the first mailing asking for biographical data and class dues will go out in early June.

**Joe Amrhein** sent word from Burlington, Vt., that in retirement he is delving into his ancestry and writing a family history. Joe married **Ethel Sullivan**, whom he met at the MIT Radiation Labs, in September 1946. He took a position with St. Michael's College in Winooski, Vt., in 1946 and for 30 years was head of the Department of Business and economics; after the department split in two, he headed the Economics Group. He retired from full-time teaching in 1986 but continued part-time until December 1991. Along the way he picked up an MBA in accounting from Boston University in 1946, an MA in economics from the University of Vermont in 1952, and a PhD in economics from New York University in 1958. On the side he ran an accounting business for 10 years, took two years off to work as a stockbroker for **W.E. Hutton**, and then returned to teaching. He worked part-time for a CPA firm auditing banks across New Hampshire and Vermont, taught courses at night for the American Institute of Banking, worked as a consultant in the economics field writing a bank letter for the largest bank in Vermont, and handled cases in utility rate making and bank mergers.

**Joe and Ethel** have three daughters, **Patricia**, **Victoria**, and **Susan**, and one son, **Keith**. Joe is looking forward to possible publication of several topics: his doctoral, which he is bringing up to date now that the subject has become a hot local topic because of a rising interest in regional history; a book of poetry featuring **Ethel's** work plus some of his own; and several short stories and miscellaneous articles. He is looking forward to the 50th and seeing all his long-lost classmates.

**Will Rodemann** and wife **Emily** are sailing *Gentle Presence* (Hinckley Bermuda 40 sailing yawl) in the Caribbean this winter. They made new friends as they sailed port to port and were amazed at how many New Englanders, particularly Mainers, they met. Will is stretched at home in Maine keeping up with his marine business and is looking forward to the 50th. . . **John Woolston** has been "at leisure," relaxing at home in Honolulu while doing a bit of roaming. This past February he and his wife and friends from Melbourne toured Tasmania. In May they toured China and in July went to a reunion of survivors of the USS *Indianapolis*. In September they explored the Pyrenees with a stop in Washington, D.C., to see their son and family.

We are very sad to report the sudden passing of **James Ruoff** on January 12 in Rochester, N.Y. Jim always enjoyed being a bartender at all our reunions and worked hard with **Pete Quattrochi** in providing the great libation at our mini-reunion in Charleston, S.C., in October 1991. We extend the class's sympathy to his wife, **Kay**, and family.



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Frank Carroll just cannot sit still in semi-retirement. Frank has merged his company, Decks, Inc., with Metal Fabricators Inc. of Rockford, Ill. The firm erects structural steel, joists, and miscellaneous iron and decking in place with their own personnel. In addition, they offer full service in machinery moving, rigging, and industrial service to industry. Clients have included GM, Frito-Lay, Coca-Cola Milwaukee, and numerous other large concerns.—Co-secretaries: Andrew F. Corry, P.O. Box 310, W. Hyannisport, MA 02672; Louis R. Demarkles, 77 Circuit Ave., Hyannis, MA 0260

## 45

Please send news for this column to: **Clinton H. Springer**, secretary, P.O. Box 288, New Castle, NH 03854

## 46

Stephen Eppner, a V-12 member who was in the 10-45 class and graduated several months ahead of us, noticed the names of class friends I mentioned in the February/March issue and wrote me for their addresses. Stephen retired some six years ago and is looking forward to the V-12 reunion at MIT next year. . . . **Tom Williams** and **Ken Davis** contacted me recently while in Colorado. First, Tom called me to visit him at the classy Embassy Suites near the newly-developing Denver International Airport. I accepted with alacrity and enjoyed a pleasant evening comparing memories of our companies, captains, and chief, thumbing through my yearbook. It was a fine time, as the weather and snow were perfect (don't ski, sad to say). Then in early March, Ken called from his daughter's house in Aurora. He, too, had a fine time at Cooper Mountain and other slopes. Good show!

Professor **William Siebert** recently wrote a column about the three fathers of radio. William has made wonderful achievements in electronic and aerospace systems. . . . **Jim Pickel**, who lives in Braintree, Mass., sends a note saying he attended his 50th high school reunion in St. Louis, and afterwards flew with 40 classmates to Maine for a seven-day cruise.

**Emerson H. Newton**, of Malden, Mass., died last March. He received an SB in general science and engineering and was a member of the research staff of Arthur D. Little for 32 years before retiring in 1980. He received the Apollo Achievement Award and other awards for his work. . . . **Betty (Bunte) Stevens** lost her life through cancer last February 13 in her home in Oceanside, Calif. She was a fine aero-engineer, along with her husband, William Stevens (another MIT grad), until she got busy with her children. She was full of kindness and was good-natured with everyone who knew her. If you would like to send a card to William, the address is 4721 Galicia Way, Oceanside, CA 92056. She will be remembered by many.—**Jim Ray**, secretary, 2520 S. Ivanhoe Pl., Denver, CO 80222

## 47

Last month we reported the death of **Charles Butler**, but we had no other information. He started working for Philippine Acetylene Co. upon his graduation in 1947 and remained with the company through his entire career. He was

chairman and CEO at the time of his death. The company was founded by his grandfather in 1910, completely destroyed in World War II and re-established by Charles and his cousin. He became a Filipino citizen in 1979 and was active in many community service organizations and clubs.

**Norman Greenman** recently retired from Rogers Corp. after 44 years. He joined the company upon graduation in 1948 as a product development engineer, became VP for operations in 1961, president and CEO in 1966, and chairman in April 1992.

Interesting note from **Oiva Anderson**: Oiva donated to Bob Lindquist, '63, a steam power plant that powered his former wood turning factory in New Ipswich, N.H. The package consisted of a circa 1908 "Fitchburg" 14 by 16 inches horizontal engine driving a 125-KVA alternator. Bob completed moving the equipment to his home in Nescopeck, Pa., in June 1992—with considerable effort, expense, and luck! He plans to restore it to full operating condition and feature it as the centerpiece of his collection.—**R.E. "Bob" McBride**, secretary, 1511 E. Northcrest Dr., Highlands Ranch, CO 80126

## 48

Before his death, **Rudge Allen** endowed a professorship at MIT. Recently, Stephen A. Benton, '63, was appointed as the first holder of the E. Rudge and Nancy Allen Professorship. Professor Benton has been a member of MIT Media Laboratory since 1982, and is the founder and director of the Spatial Imaging Group there. His principal research interests are imaging physics, holography, three-dimensional imaging, optics, and communication theory. He received an electrical engineering degree from MIT.

**Donald Perkins** has retired from Raytheon Co. He enjoyed working on state-of-the-art radars for many years until the Cold War was won. He has started to catch up on the all the neglected projects at home, and he and wife, Bea, are planning some travels. . . . **Harrison Rowe** is professor of electrical engineering at Stevens Institute of Technology in Hoboken, N.J. . . . **Frank Iskra** is looking forward to attending his first reunion with the Class of 1948. . . . **John Walch** retired from PSE&G after 44 years of service in the utility industry. His wife, Zel, is still teaching in the Nutley school system.

**Otto Wetzel** "retired" in 1981 at 55 years to handle his own affairs. He has an interest in a building that he manages in Dallas' West End Historic District. Recently he has been involved in the start-up of a small natural gas company. His activities keep him from being under Jane's feet. . . . **Norm Herbert** spent January in Central America. At Tikal looking down from Temple V, he saw monkeys in the trees. He climbed 2,000 meters up Mt. Chirripo in Costa Rica, but didn't have time or energy to go the last eight kilometers to the top. Spring term, he will teach economics at the University of Bucharest.

As part of 45th Reunion plans, **Sonny Monosson** and **Bob Sandman** invited classmates to their homes to discuss activities. In addition to committee members, **Genie** and **Dave Finnegan**, **Ann** and **Ken Brock**, **Stan Shein** and **Irene Kalfon**, **Joan** and **Sam Hanna**, **Lorraine** and **Stan Abkowitz**, **Joan** and **Bob Turkington** attended one or both of the gatherings. **George Clifford** invited the Reunion Committee to his home for detailed discussions of the plans.



George Brown has married Wilma Cason, widow of a long-time co-worker at American Motors. George's first wife, Mary, died last year after a long struggle with emphysema. They had been married for 48 years, and the first 45 years had been good. George and Wilma will live in Dallas. . . . Warren King has a travel schedule (in retirement) that is just as complicated as when he consulted with a half dozen state governments. He and his wife, Jean, took four grandchildren and their parents to Disney World and 10 days in Florida. Despite much needed rain in California, they had a good winter in Rancho Mirage. They hope to spend at least a month in their Illinois home before heading to New York and New England.

Sonny Monosson and his wife, Gloria, did some sailing in the Carribean on a 52-foot boat with comfortable cabins. While walking on the dock, he met Anita and Verity Smith who had arrived for the same purpose. . . . Dick Baker is keeping busy with Mr. Tony, Inc., his custom clothing and alteration company in the heart of the NYC garment center. His wife, Joan, is co-head nurse at the New Rochelle, N.Y., medical emergency room. The update on his children: Richard, Jr., married, San Francisco, stockbroker; Sally, computer consultant, Arthur Andersen; Karin, beautician; Julie will graduate with master's in tax accounting in May 1993; and Michael is a freshman in computer science at University of Wisconsin. Their dog is the most wonderful pet ever.

Al Baum is working for OSHA trying to ensure worker safety. He is constantly appalled by how little really gets done by federal workers—and appears to be tolerated by the system "management." . . . Victor Dawson is retired and spends his time camping, hunting, and fishing. He and his wife, Marguerite, spend a lot of time at their second home at Dennisport on Cape Cod. They recently celebrated the birth of their 16th grandchild. . . . Warren Johnson is retired from Hughes Aircraft and is busy with volunteer activities and travel.

Mark Kirchner retired from Boeing Commercial Airplane Co. after 40 years with company. His last position was director of engineering technology. Since retirement he has done some volunteer tasks for NASA and the National Academy of Engineering. He is active in flying, sailing, and skiing. His wife, Mary Lou, and their children are all in good health. . . . Leon Mark is doing a little consulting for the Air Force and a couple of private companies. . . . Clif Moss is serving his third two-year term on the Corpus Christi City Council. He retired from a management career in pressure vessel fabrication for the refining and chemical processing industries.

Don Noble and his wife, Nancy, are happy that Stacie, their youngest daughter, graduated from Georgetown Medical School in May 1992 and is interning at St. Elizabeth's in Boston while living at home. Stacie is going to Dartmouth for her three-year residency in anesthesiology. Stacie is their sixth child to finish college and graduate school beginning with Debbie at Wellesley in 1968. Whew! . . . Bill Weisz is officially retired, but he is vice-chair of the Motorola board of directors and does consulting for Motorola. He is teaching at Motorola University and giving special seminars and classes for MBA and engineering students at a wide range of colleges and universities.

Curtis Green and his wife, Joan, have three grandchildren. He has been playing a lot of golf. They have a condominium in Fort Myers, Fla., and spend most of the winter there. He suggests calling him if you are in Fort Myers or Tulsa, Okla. . . . Norbert Andres had a pace-maker installed so that he could continue to

play singles tennis and ski at high altitude. His son is taking over his rep business, and Norbert has started teaching again as adjunct professor at SUNY College of Technology. He is planning to teach and consult in market research.

Irving Steinhart died in Miami in September of last year. I have no further details. . . .

Richard Davis died from cancer at his home in March of this year. Davis had been with a law firm in Boston and continued to practice law from his home during his illness. He and his wife, Sonya, had been living in Wellesley. On behalf of our classmates, I extend our sympathy to the families of both our classmates.—Marty Billett, secretary, 6 Greenwood Ave., Barrington, RI 02806, (401) 245-8963

## 49 45th Reunion

Eleven months from now, June 4-6, 1994 (Saturday through Tuesday—please mark your calendars), we will be celebrating our 45th Reunion at the Castle Harbour Hotel in Bermuda. This is the same hotel where we gathered for our 25th 20 years ago! Co-chairs for the affair are Jack Barriger of Kenilworth, Ill., covering the world west of Chicago, and Stan Margolin of Hyannis, Mass., rounding up the faithful east of there.

We will leave as a group from Logan Airport Saturday morning, having enjoyed the Thursday and Friday programs at the Institute. And regarding that program: The Institute always provides intellectually stimulating, useful, and enjoyable activities, starting Thursday evening with Tech Night at the Pops. Your committee will be there and urges you to be there also. Reminder: At this gathering, decorum will be practiced at all times and those who find it necessary to speak above a whisper will be asked to use the telephone.

Norman A. Chrisman, Jr., of A.I.A. chair of the board of CMW, Inc., Lexington, Ken. (formerly Chrisman, Miller, Woodford, Inc.), announced his retirement effective February 28, 1993. Over its 31-year history, Norman's architectural firm, which he founded with Kenneth V.L. Miller in 1962, has grown from three to forty-five employees and from two to seven partners. In his leisure hours, Norman is affiliated with 11 schools, churches, and other charitable organizations, often as trustee or president. He is a member of the MIT Educational Council and the



Norman Chrisman

MIT Alumni/ae Association. The work of his firm is represented in Kentucky by seven churches, one sorority and two fraternity houses at the University of Kentucky, five buildings at Pikeville College, and residences, school buildings, and the Buckhorn Lake State Park Lodge.

Rush Taggart, 68, died January 11 after a long illness at the Berkshire (Mass.) Medical Center. Rush received a degree in chemical engineering from the Institute and worked for the Union Carbide Corp. He lived in Stockbridge, Mass. He is survived by two sons, a daughter, two brothers, a sister, and five grandchildren. The class is saddened by this loss and extends its condolences to the family.—Fletcher Eaton, secretary, 42 Perry Dr., Needham, MA 02192, (617) 449-1614

## 50

Please send news for this column to: Jack T. McKenna, secretary, P.O. Box 376, Cummaquid, MA 02637

## 51

Having retired from the New York State comptroller's office last October, David A. Grossman has been consulting as president of The Nova Institute and teaching as adjunct professor of International Affairs at Columbia University. His consulting has brought him to such diverse places as Honduras and Czechoslovakia. He and his wife spend about half of their time in Brooklyn, N.Y., and half in Litchfield County, Conn. Their Connecticut home was extensively rebuilt to his design about a year ago. . . . Dr. Romeo G. Bourdeau retired from Pratt-Whitney in March 1992.

After 27 years of service, Professor Walter Schwab has retired from the Department of Electrical and Computer Engineering at Northeastern University. Professor Schwab joined Northeastern in 1966 after having been on the faculty of MIT and having worked at United Tool Corp., Bendix Corp., and Dunn Engineering Associates. At Northeastern he taught in the areas of electronics, electro-magnetics, and electromechanical dynamics.—Martin N. Greenfield, secretary, 25 Darrell Dr., Randolph, MA 02368

## 52

Raymond Morth of Sudbury, Mass., died January 27, 1993, as the result of a skiing accident. A graduate of course VI-A, Ray was a member of Eta Kappa Nu, the electrical engineering honor society, and Phi Gamma Delta. He worked at Draper Labs on guidance for the Apollo spacecraft project, and at Intermetrics on guidance, navigation, and control for the space shuttle program. He is survived by his wife, a daughter, two sons, a stepdaughter, and stepson.

We noted the death of Philip Hallof in last April's column, and mentioned we had no further information. Norman Ness, '55, who was in graduate school in Course XII with him, kindly sent some and promised to try to get more. He says that Phil was a successful leader in exploration geophysics, first with Mcphar Geophysics, and then with Phoenix Geophysics.

I have heard from no one about the proposed Far East reunion described here last April. Is there no interest?—Richard F. Lacey, secretary, 2340 Cowper St., Palo Alto, CA 94301, e-mail: lacey@hpl.hp.com

## 53

Please send news for this column to: Gilbert D. Gardner, secretary, 1200 Trinity Dr., Alexandria, VA 22314, (703) 461-0331

## 54

### 40th Reunion

Early word on our 40th Reunion has been pried out of Bob Warshawer, our permanent reunion chair. Festivities will run from June 1 through June 5 (Wednesday through Sunday)



1994. Mark your calendars now! Preliminary plans call for a reception at the President's House followed by dinner on Wednesday, the Pops Concert on Thursday, Alumni Day followed by a boat ride with dinner on Friday, moving to Cape Cod and a barbecue on Sunday. Those who want to stay at the Cape longer for their own vacation will have the opportunity to do so. Details may change, but the dates are fixed. The reunion is starting somewhat earlier than usual, so early planning is appropriate. More details will be sent by Bob very shortly.

In the meantime, Bob and Natalie are doing well. Bob took early retirement several years ago, as you probably remember, and started a custom picture-framing business in Lexington, Mass. The business has prospered and Bob has become very active in the profession. He is a director of and the program chair for the New England Professional Picture Framing Association. He had a show of his work a month or so ago and sold several of his photographs, not to mention the frames. And, he tells me, there is a possibility that MIT will be sponsoring a show of art and photography by alumni about the time of our reunion. If you are interested in such an enterprise, call Bob at (617) 862-3834.

I am very sorry to have to report the death of Bill Ryer last January. Bill was VP of T. Thomte and Co. of Boston until 1985, when he established his own financial consulting business. He was an avid curler and an officer of the Grand National Curling Association. Our sincere sympathy goes to his wife, Jane, and their two daughters.—Edwin G. Eigel, Jr., secretary, 33 Pepperbush Lane, Fairfield, CT 06430, (203) 576-4983

## 55

**Edward A. Bryan**, Course III, now owns and manages a foreign language translation and information retrieval service in Ridley Park, Pa. His firm translates engineering documents, patents, and the like to and from most of the commonly used technical languages and searches DIALOG databases for relevant technical information. Anyone needing that kind of service can reach Ed at (215) 521-2679.

Although Lee Zuker threatens bodily harm if we use his and Marlene's annual Christmas newsletter (always interesting and entertaining) as fodder for our class notes, paucity of items from the rest of you forces us to mention at least a couple of extracts from that to have *something* to report! Lee did a lot of traveling during 1992 for business and pleasure: to Moscow for a jet engine convention; Paris, where he snuck in attendance at their classic automobile show called Retromobile; and Australia, where he and Marlene participated in various events of the Australian Rolls Royce Club including a Guinness-record-setting parade of 137 Rolls Royces. They also devoted much of the year to buying and fixing up a wonderful-sounding house on south Puget Sound, complete with resident oysters and clams on 200 feet of low bank tidelands and an orchard with a variety of fruit trees and grapevines. Lee says that they have five large bedrooms and will welcome guests who make it to the great Northwest (but maybe that's the part he didn't want me to publish!).

Roger Reiss wrote to compliment us on some recent columns and urged us to continue

emphasizing news notes from classmates who are still active professionally, rather than dwelling on retirement announcements or death notices, which, of course, we never like to report. Naturally, our notes are only a reflection of what we receive from all of you either directly or through the Institute, so let's hear it especially from those of you who, like us, are still in the saddle!—Co-secretaries: **Roy M. Salzman**, 4715 Franklin St., Bethesda, MD 20814; **James H. Eacker**, 3619 Folly Quarter Rd., Ellicott City, MD 21042

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**M. Philip Bryden**, a professor at the University of Waterloo in Ontario, Canada, has been elected a fellow of the Royal Society of Canada. . . . **Ward Halverson** is the manager of the Directed Energy Division of Spire Corp. in Bedford, Mass. He reports that he is working on the research and development of flat panel displays. On the personal side, he recently became the proud grandfather of a grandson. . . . **David L. Kaufman** is consulting for clients who want to design instruments based on embedded microprocessors, A/D and D/A converters. David does mainly hardware design, but can assist with software architecture also. He is located in Lexington, Mass.

**John Niesse** has retired from the Monsanto Co. and is consulting on corrosion and materials engineering from his Manchester, Mo., residence. . . . **Irwin Dorros**, the executive VP who has headed Bellcore's technical services since the company's founding, will retire this July. He has been an influential figure in telecommunications

technology in a career that has spanned 37 years. During his more than 10 years as Bellcore's chief technical officer, Dorros has overseen the consortium's technical efforts on behalf of the seven large regional telephone companies that own Bellcore. That work has involved hundreds of projects on behalf of Bellcore's owners and other clients in the areas of network technology, operations technology, software technology and systems, and applied research.

Dorros began his career in telecommunications with Bell Telephone Laboratories in 1956 upon graduation from MIT with SB and SM degrees in electrical engineering. In 1962 he was awarded a doctor of engineering science degree from Columbia University. At Bell Labs, Dorros worked on and led programs on electronic switching, data communications, pulse-code modulation digital transmission systems, cellular radio, microwave radio, satellite, network digitalization, Picturephone, data communications and computerized operations support systems.

In 1978 he joined the parent AT&T Co. as assistant VP for network planning. He led the planning for the evolution of the then Bell System nationwide network. During this assignment he was a participant in the negotiations and framing of the terms of the settlement of the AT&T antitrust case. He was designated to his current position in Decem-



*Shown at the opening of the 16th International Laser Radar Conference last July in Room 10-250 are (from left): Gil Davidson, '55, PhD '59, organizing chair; Bob McClatchey, '60, SM '61, general chair; Professor Giorgio Fiocco of University "La Sapienza," Rome, who delivered the keynote address; President Charles Vest, who gave the opening welcome; and Earl Good, SM '60, program chair. The meeting brought together 250 scientists to discuss applications of lidar (light detection and ranging) to environmental and global change phenomena and to enjoy the MIT campus.*



ber 1982. He has led the creation of the technical services portion of Bellcore and guided the execution of its programs. Dorros is a member of the boards of directors of Bellcore, of Microelectronics and Computer Technology Corporation (MCC), and of Vertex Industries, Inc. He is chairman of the system subcommittee of the Federal Communications Commission's Advisory Committee on Advanced Television Services.

Dorros is a fellow of the Institute of Electrical and Electronics Engineers (IEEE) and a member of the National Academy of Engineering. In 1990 he was awarded the IEEE Engineering Leadership Recognition and in 1991 the IEEE Founders Medal. He also was awarded the 1992 Science/Technology Medal by the Research and Development Council of New Jersey. He holds five patents and has published numerous articles on telecommunications, with particular recent emphasis on information networking.

I am sorry to report that **J. Phillip Bromberg** of Pittsburgh, Pa., died December 9, 1992. Phil graduated in chemistry and received a PhD from the University of Chicago. After several years of teaching and research at Carnegie-Mellon, he obtained a law degree and set up practice in Pittsburgh, where he and his wife lived.

Send news to: **Ralph A. Kohl**, co-secretary, 54 Bound Brook Rd., Newton, MA 02459

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Please send news for this column to: **John T. Christian**, secretary, 23 Fredana Rd., Waban, MA 02468

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Please send news for this column to: **Mike Brose**, secretary, 75 Swarthmore St., Hamden, CT 06517

## 59

### 35th Reunion

Again, a good level of activity continues on the notes front! Several people have expressed some reticence about submitting notes, unsure of the formalities and the format. Let me assure you that there are none, except pure legibility! Become another first time Class Notes Correspondent!

**Robert Boder** reports that he became a principal and owner at Monacelli Associates, an architectural and urban design firm in Cambridge, specializing in hospitality and correctional projects and urban design. . . . **Robert Polutchko** and **Betty** are getting ready to celebrate the end to college expenses as their youngest (of four), **Karla**, graduates from the Course XIV grad school! Bob is keeping busy with the task of merging General Electric Aerospace into Martin Marietta, which he believes is a good match bringing many fine GE people to Martin Marietta.

The Class of 1959 Student Aid Fund, established in conjunction with our 25th Reunion, is doing great things. Five students are receiving the scholarship for this academic year, all with connections to MIT through their fathers, and in one case, grandfather. The names are **Sabrina** and **Dirk Bernold**, **Sarah Vitek**, **Christopher Schnyer**, and **Nicholas Gao**.

I did receive a very nice letter from **Sabrina**, which opens, "I'm writing to personally thank

you and everyone else involved in the Class of '59.... Without your help, I would probably not be here right now." **Sabrina** is a very active sophomore economics major, rows lightweight crew ("I stroked our lightweight four in the Head of the Charles this year and it was amazing!... We're aiming to beat Radcliffe this spring—keep your fingers crossed."), lives in a sorority ("the walks across the Mass. Avenue bridge can be quite fierce... sometimes I have to hold onto the railing to keep my balance"), and is running for class treasurer. She wrote "so you can picture a real person, not just a random name on a piece of paper."

A note from **George Foyt**, who is manager of Electronics Research with United Technologies in East Hartford, Conn., updates us on **Brad Bates** who is with the Electric Vehicle Program at Ford. After graduation, Brad worked for a variety of companies involved with computers in both commercial and aerospace applications. He went to Ford in 1972, developing the on-board computer to control engine operation. In 1982 he took charge of the Electric Vehicle Research Program, the foundation for his present work, aimed at meeting the California requirements for non-polluting vehicles. Because California is viewed as a forerunner for other states, and perhaps for other nations, the program is of considerable importance. George also reports that "Brad did note in passing that he has never worked so hard, or in a job in which the pressures were so great. On the personal side, Brad and Lydia live in Ann Arbor, and Lydia is active in developing the Anti-Coagulation Clinic at the University of Michigan Hospital, and their three children are off on many pursuits."

A word on the sailing expedition to the British Virgin Islands, which occupied **Bette** and **Larry Boyd** and  **Ginny** and **Dave Packer** for a week in January. The word is "fantastic" and my hope is that Captain Boyd will provide a fuller report from the log soon.

On a somber note, I have received notices that two of our classmates have passed away recently. **Granville H. Sewell**, professor of public health and environmental sciences at Columbia University for 25 years, died on December 24, 1992, leaving his wife, **Martha Merrill**, two daughters, and two sons. He had resided in Englewood, N.J., and had authored a textbook, *Environmental Quality*, and was a consultant to many developing countries. . . . In addition, without detail, a notice was received of that **Norman A. Fujiyosha** of Braintree, Mass., also died recently.

As a final note, our thoughts and sympathies go to **Steve Samuels** whose wife, **Myra**, died just before Christmas. We are glad to have gotten to know her at our last reunion on the Cape. That's all for now. Again, send an update which will be much appreciated by your classmates!—**Dave Packer**, president, 31 The Great Road, Bedford, MA 01730, (617)-275-4056

## 60

Our volume of class news is waning. Please let us know what you are doing, as I'm certain you'll have many interested readers. Don't be afraid to blow your own horn.

**Barbara Stephenson** writes, "I am an attorney in Albuquerque, N.M. I just had a book published entitled *Financing Your Home Purchase in New Mexico*. We can now count Barbara among our published authors."

I also received a letter from **Norman Vadner** who gave some helpful hints for my class agent activity—fund-raising. (Norm, are you interest-

ed in the job?) Actually, Norm suggested that I pass his views to my wife, **Marie**, whom he met when she was a district director for Tech's *Campaign for the future* and is now in a similar position for the UK's Oxford University. Norm is president of First MainLine Corp. in Bryn Mawr, Pa.

In a letter from Arlington, Mass. (to Arlington, Va.), **Dan Whitney** writes that he recently has had two fascinating periods of international living. Dan and his wife, **Cynthia**, '63, spent three-and-a-half months in Tokyo in 1991 and six months in London in 1992. Both visits resulted from his work with ONR contracts with Draper Laboratory. Dan is now on the third leg of the ONR project, telling U.S. companies of his foreign experiences and studying their product development processes. Dan says in Tokyo they learned to eat out for less than \$20 by going into local Mom-and-Pop restaurants and pointing and smiling. "While in London, we largely avoided bombs, lived in a converted 1850s house, and saw many outdoor locations where the BBC films *Mystery* and other shows."

Finally—and this goes back to the horn blowing bit mentioned above—on the Ides of March I joined the ranks of grandfathers for the first time. Son **Steve** and his wife, **Wendy**, became the parents of **Robert Charles**. Needless to say, he is the most beautiful grandchild ever!—**Frank A. Tapparo**, secretary and class agent, 15 S. Montague St., Arlington, VA 22204

## 61

**Pete Buttner** died in January after a terrible five-year struggle with tongue cancer. Pete was very candid about his condition. He wrote dozens of letters describing his treatment strategy and its ups and downs to his friends around the country. Last June he wrote to say his doctors gave him no more than a year of life but he still felt there was some combination of therapies which would help. I guess not.

After a hitch in the army, Pete came back to MIT with the job of automating the financial aid office. A few years later he became associate dean of student affairs. Then after getting a master's from the Sloan School he went to Vermont to work for Boise Cascade where he remained until retirement. I know his friends in the class will miss him and send their condolences to Joan, his wife, and to his children.

A letter from **Ted Hammack** says that after eight years at Shell Development Co. working in materials development and another nineteen years at Raychem Corp. in various roles, including a successful internal venture he has gone off on his own as a consultant. His specialty is guiding small companies toward a market focus for new technologies. His company, Hammack Associates, (Box L) is in Los Altos, Calif. (Fax: 415-948-5433, CompuServe Mail: 72400.45). . . . Another letter came from **Jake Karrfalt** (internet: jake@simon.unh.edu) who expressed interest in setting up a class bulletin board. He lives up in New Hampshire where he founded Alternative System Concepts three years ago. The company develops niche tools for the electronic design automation industry. For you automation jocks, here is what they make: "a test insertion tool that automatically adds IEEE 1149.1 boundary scan to VHDL designs using Supplement B (BSDL)." I assume someone knows what that means.

I got a membership list of the Department of Energy's High Energy Physics Advisory Panel the other day. To my astonishment 2 of



the 16 illustrious physicists on the list were from our class: **Ed Berge** who works at Argonne National Laboratory and **Don Hartill** who is at Cornell. Amazing! . . . **Howard Fine** wrote that he is an ophthalmologist specializing in cataract and intraocular lens surgery. He has published about 80 articles, textbook chapters, and teaching videotapes. He spends about 30 percent of his time teaching and demonstrating advanced techniques in cataract surgery worldwide. Howard is listed among cataract surgeons in the first edition of the *Best Doctors in America*, 1992–1993. Wow, congratulations! However, if you want him to work on your eyes, you'll have to go to Eugene, Ore., where his practice is located. . . . **Leo Hieblinger**, who lives even further west, in Hong Kong, wrote that he has been Far East regional manager for Sandvik, Co. His activities concentrate on the People's Republic of China, where business has been growing very rapidly. Leo would be glad to get together with any classmates passing through Hong Kong. If you want his address just ask.—**Andrew Braun**, secretary, 464 Heath St., Chestnut Hill, MA 02167, or via internet: andrewb820@aol.com.

## 62

I received an e-mail message from **Barry Roach** (aka Barrett B. Roach) concerning the lead item in the April Class Notes. Barry denies any knowledge of or association with, Elexis Corp. of Miami, Fla.—don't blame us, the news clipping service claimed they read it in the *San Francisco Chronicle* on September 2, 1992.

Perhaps we should only depend on the accuracy of news items in *The Weekly World News*.

Barry was CFO for Network Equipment Technologies in Redwood City, Calif., before moving to his current position with Fair, Isaac & Co. in San Rafael, Calif. Both he and I are at a loss to explain where the rumor of his living in Florida originated, but perhaps someone did read it in the *Chronicle*. He and associated members of his household have moved to Sonoma, Calif., are building a house on their pinot noir vineyard in Glen Ellen, and are paying for all of this by helping Fair, Isaac venture into new areas. The first of which was an acquisition in Minneapolis, completed last December. Barry claims to have had better success developing new businesses for Fair, Isaac CEO Larry Rosenberger, '68, than in peddling his pinot grapes to Dave Stare at Dry Creek. Barry may be contacted on e-mail via: ficolfico01bbr@apple.com.

The proxy for my Exxon stock had a familiar face among the board of directors of Exxon—none other than **Robert E. Wilhelm**, senior VP of Exxon and a member of the board since 1992. I remember running a news item about Bob when he was promoted to executive VP of Exxon Co., International in 1986, but don't recall mentioning his promotion to senior VP in 1990 nor his election to the Exxon Board in 1992. In addition to Bob's activities with Exxon in Irving, Tex., Bob serves as vice chair of Council of the Americas, is a member of the Coal Industry Advisory Board of the International Energy Agency, Council of Foreign Relations, the board of governors of the Foreign Policy Association, and the MIT Political Science Visiting Committee. In his spare time he is VP, Circle 10 Council, Boy Scouts of America,

and a trustee of the Greenhill School, Dallas, Tex. I'm always pleased to see one of my classmates staying active in the Boy Scouts of America—I'm completing my fifth year as District Commissioner of the Vulcan District for the Birmingham Area Council, BSA—and it pleases me that someone as busy as Bob is willing to take the time to help an organization that plays an important role in guiding our nation's youth to fulfill their role as tomorrow's leaders.

**Tom Burns**, manager of corporate economics for Chevron, continues as Chevron's chief spokesperson on economic and energy matters in the newly reorganized corporate planning staff. We wonder if Tom has seen any recent evidence of the universal acceptance of the "Smoot" as a unit of linear measurement. I recall some time ago that he noted a bridge in San Francisco delineated in Smoots! . . . **Bill Koch** and **Carl Wunsch** were both featured lecturers on the morning program commemorating the centennial of the MIT Department of Ocean Engineering (formerly naval architecture and marine engineering, Course XIII), at Technology Day, June 4, 1993. Bill talked about "The Management, Technology, and Victory of an America's Cup." I believe we were privileged to hear an earlier incarnation of this talk at our 30th Reunion last year. Carl, who serves as professor of physical oceanography at MIT (Course XII) talked about the "Effects of the Ocean on Global Climate."

Once again we have the sad task of informing the class of the loss of two of its members: **Stephen E. Amador** passed away on October 22, 1992; and **John P. Morenski** died on January 24, 1993. Stephen E. Amador was born in Brooklyn, N.Y., and grew up on Long Island. He was a member of Phi Kappa Sigma Fraterni-

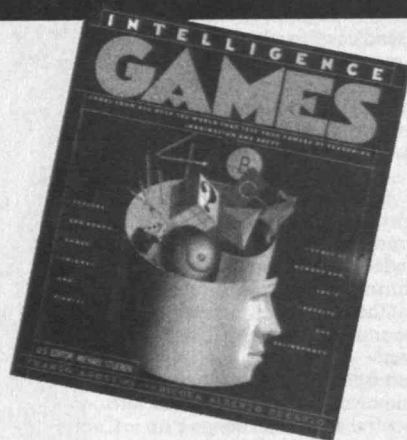
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ty while a student at MIT. He spent his entire 30 year career with Ford Motor Co. in Dearborn, Mich. Over the years he enjoyed racing his Hobie Cat Sailboat. He is survived by his wife, Pricilla, and two daughters, Kristen and Kari, who are living in Michigan. . . . John P. Morenski, born in Newark, N.J. He received his SB in mechanical engineering (Course II) from MIT, and an MS, also in mechanical engineering, from Northeastern. John worked for Textron Industries in Wilmington, Mass., and was formerly at Avco Defense Systems. He is survived by Geraldine (Conway), his wife of 29 years, son John, a student at the University of Chicago, and daughter Kathleen, vice-consul at the American Consulate in Toronto, Ontario, Canada.

Join your classmates on MIT1962 if you have an e-mail capability that will connect with internet. Write me for details. As always, even if you don't use high tech communications, just send a note or card via the U.S. Postal Service to: Hank McCarl, secretary, P. O. Box 352, Birmingham, AL 35201-0352

## 63

Well, here we go with a pile of notes, flushed out by the notice of the 30th Reunion. I apologize that this column's notes are in part left over after filling the May/June column. Joel Schindall lives in Poway, Calif., and works in San Diego where he is president of Conic Division of Loral Corp. He and wife, Alice, have two daughters, Katie and Julie. . . . Alan Shuchat is in the Math Department at Wellesley College, living in Newton Centre. He was associate dean for three years, but still found time to develop—with Fred Shultz, a CalTech grad—Joy of Mathematica, a Mac mouse interface for the symbolic computation program Mathematica.

Regrets from Harold Solomon that money and unfinished book writing prevented him from getting to the 30th. He'd love your calls at 0423-76-5615 in Tokyo. . . . After eight years Roger Gans stepped down as chair of mechanical engineering at University of Rochester. He still does amateur and semi-pro theater. Roger couldn't make the 30th; he was in Paris as "invited professor" at the University of Paris. . . . Bob Turtz is a partner in the North Jersey law firm Weiner, Lesniak doing corporate law. His older son is finishing law school at Washington University in St. Louis, and younger son is a freshperson there. Bob also has a 3-year-old step-grandson. . . . Larry Beckreck lives in Derby, England, and his phone is 011-44-332-292612.

Frank Fradin remains at Argonne National Lab after 25 years. He and wife, Joni, have a son who is an attorney in Chicago, one who is working on an MBA at University of Chicago, and one graduating from University of Illinois. Frank and Joni live in Glenview, Ill. . . . Another long-timer is Paul Richman, co-founder and now chair of Standard Microsystems, a LAN and semi-conductor supplier in Saint James, N.Y. He also heads their Japanese subsidiary, Toyo Microsystems. He, wife, Ellen, and two youngest kids lived in Tokyo for two years, but are now back in New York. . . . Here's a note from Oiva Anderson, '47, about our Bob Lindquist. It seems last summer Bob picked up from Oiva a steam plant that includes a 1908 horizontal steam engine driving a 125 KVA alternator. It once powered a wood-turning factory. Bob, what are you using it for, powering all of Nescopeck, Pa., where you live?

Robert Gilbertson is president and CEO of CMX Systems, manufacturers of precision positioning systems, after a term as chair of the American Electronics Association. . . . Gene Sprouse is chair of physics at SUNY-Stony Brook. He is successfully fighting the New York State budget and getting federal research grants. . . . Larry Kazanowsky, who works for Ford Motor heading up engineering and manufacturing of plastic and composite parts, has made frequent trips to Europe. Ford is launching plants in France, Poland, and the Czech Republic. He and his wife, Cara, and two teenage kids live in Orchard Lake, Mich. . . . Since getting a doctorate, Jack Solomon has been with Union Carbide. Still, last summer they were spun off as a \$2.5 billion start-up (!?) called Praxair. He and wife, Janis, have three daughters and a grandson.

Steve Fisher is finishing his fifth and last year as associate dean for undergrads in arts and sciences at Northwestern. Steve remains professor of math. His oldest child is a first-year college student and the next child just finished high school. . . . Dave Johnson called me from Connecticut where he is a technical headhunter (203-453-5511 if you need a job). Son Jack, born after junior year, is 30 and has three sons of his own. Katherine is 27 and at the London School of Business. Bill, 24, teaches English at a university in Indonesia! Elizabeth, 16, is at home, busy with dancing, singing, and acting. Wife, Lila, is an RN doing research in Yale's pediatrics department, studying cocaine babies. . . . Carlos Uribe is living in Brimfield, Mass. Sons Julian, Juan, and Jorge graduated Georgetown, American U., and Northeastern, and all found jobs in sunny Miami. (Carlos, did you have to do this to me? I just returned from a Florida vacation to get hit by the Blizzard of '93!) Carlos and wife, Graciela, retired and bought a 60-acre farm, with 1830 house, barn, carriage house, trout pond, woods, etc. He is also active in home and barn restoration. Four months after becoming a U.S. citizen, Carlos voted in his first presidential election, and believes his vote decided the outcome, he says.

Okay, that cleans out the docket, except for a personal note. My son Gary, 23, is just getting a PhD from the 'Tute's Brain and Cognitive Science Department. He starts in September as assistant professor of Developmental Psychology at UMass/Amherst. He turned down another faculty position (they had a bidding war for him) and a couple good post-docs. You can say I am just a bit proud of him. Regards from Baltimore.—Phil Marcus, secretary, 3410 Orange Grove Ct., Ellicott City, MD 21043, (410)-750-0184, CompuServe: 72047.333, or internet: 72047.333@compuserve.com.

## 64

### 30th Reunion

Less one year till our 30th Reunion. WOW!

Several of you have been kind enough to respond to my monthly tag line, "Please write." Dave Saul used the occasion of a career transition to send along his news. After 26 years at IBM, primarily with the recently closed Cambridge Scientific Center, Dave joined State Street Bank and Trust in Boston as a VP, managing their Systems Software Department. He reports that even with the change, he is still concerned with most of the same software topics—operating systems, networking, and related technologies. He's enjoying his new environment a great deal and invites classmates to get in touch with him at (617) 985-2968.

A somewhat longer note from Russ Norris is excerpted below: "The passing of the half-century mark wasn't nearly as traumatic as I had feared. In December 1991, our daughter Claire finished her doctoral dissertation at MIT and in May 1992, we proudly watched her receive her hood and diploma. In August, my wife, Dixie, received an MBA from the University of South Carolina. And, in October, the year was capped off when Dixie and I became grandparents for the first time. Little Bruce Clement is the first member of the class of 2015 from our family.

"Otherwise, life continues much as before. I am still teaching theology and administering the field of education program at Lutheran Theological Southern Seminary in Columbia, where Dixie is VP for business affairs. Our daughter is the only one with a new job description. She now works for Molten Metal Technologies, a high-tech environmental engineering company, partially owned by MIT, with offices in Waltham. The only negative is that she and our grandson are so far away." Thanks for the news, Russ.

A Fund Note from Tom Daniel in Kailua-Kona, Hawaii, states that he has just completed 10 years with the Natural Energy Laboratory of Hawaii, a state-run facility for research on OTEC and related technologies. They are pumping ashore large volumes of deep ocean water for use in energy demonstration projects and in several aquaculture ventures growing things like abalone, salmon, Maine lobster, and micro-algae. Tom's responsibilities involve coordination of these projects and operation of an extensive environmental monitoring program. His 22-year-old daughter Sara is teaching preschool in St. Petersburg, Russia. Tom, Alice, and 10-year-old Michael like to hear from any friends visiting in Hawaii. Aloha!

Tom Thornbury writes from Toluca Lake, Calif., that it's been a good year: new home, new granddaughter, he set a round-the-world speed record on the Concorde, and he got his company Softub, Inc. onto the "Inc. 500 List" at No. 56.

After three years as president and CEO of the Foundation for Informed Medical Decision Making and feeling good about getting our library of interactive video programs for patients successfully launched with a commercial partner, I decided to transition to a more diverse set of challenges and have established a health care management consulting practice. Goodness knows that there are enough health care problems to be solved in the United States; I'll see what I can do.

Let's hear your news.—Joe Kasper, secretary, RR 2, Box 4, Norwich, VT 05055

## 65

Kayson Nyi writes that he is back in the R&D world as research director for polymers and resins at Rohm and Haas in Philadelphia. Kayson ran in the Marine Corps Marathon in 1991 and as a result qualified for the Boston Marathon. He reports he "died" after Wellesley and had to walk the rest of the way ("it takes a long time to walk 10 miles"). Our normal viewing spot is the top of Heartbreak Hill (it's about three blocks from the house), and I've never envied those who actually tried to make it through the marathon.

John Beckman reports that his daughter, Deborah, is just finishing her second year at Columbia Law School and is a member of the Law Review and a Harlan Fiske Stone Scholar. John's publishing company, Dushkin Publishing, continues to prosper with various



non-mathematical books in the social sciences. He reports the current hot topics are wellness and education. After leaving MIT, John worked for Westinghouse and then Peat, Marwick before joining Dushkin in 1971, which was a struggling startup funded by CBS. As many of us can attest, the first five years of any startup are often difficult, but Dushkin has done well since the late 1970s. John is one of three principals. He reports that he is active in the MIT Club in New Haven, that he regularly tries to keep in touch with Ken Ross, and has celebrated his 25th anniversary with his wife, Adrien.

In the continuing news area, Dick Larson was elected to the National Academy of Engineering. Just goes to show how important waiting lines are in the 1990s! Dick was honored "for developing and applying operations research methodologies in public and private-sector industries." . . . Dave Moran writes that he is now the associate director in the Office of the Chief of Naval Research, and that son Scott (MIT '90) is now in Navy Vet Pilot Training School as a lieutenant JG, and daughter Lindsay (Harvard '91) is now a graduate student at Columbia. . . . Finally, I got a delightful note from Bill Roeseler reporting that he helped Bill Koch in the defense of the America's Cup and is now concentrating on Kiteski, to bring high-speed kitesailing to the consumer market. His real love, however, appears to be his 5- and 8-year-old grandchildren!—George McKinney, secretary, 33 Old Orchard Rd., Chestnut Hill, MA 02167, (617) 890-5771

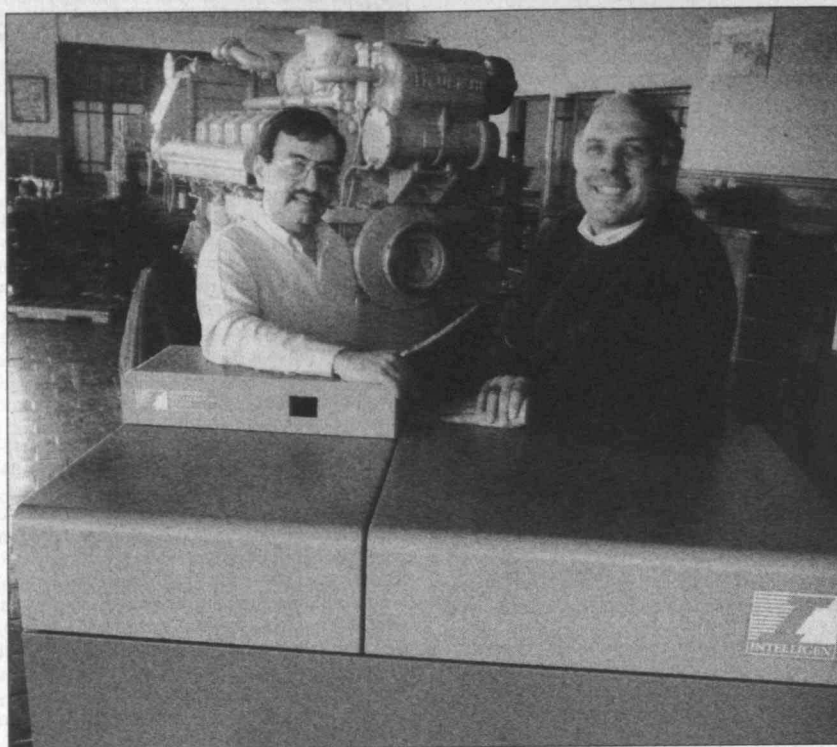
## 66

Michael Ward finds it amusing that after years of doing hardware and instrumentation design he is now working at a software company, Adobe, in San Jose, Calif. He is, however, still working toward publishing books in digital form. . . . Also from California, John Rible has been in Santa Cruz for seven years where he has a house with fruit trees, berries, and veggies in the "back 40" (40 square feet). He is a volunteer teacher at an alternative public elementary school, editor of the soon-to-be-published ANSI Forth standard, and sometimes programmer and chip designer. His wife's book, *The Solstice Evergreen*, about the history and folklore of the Christmas tree is doing well. She works for a local publishing house and is the main breadwinner for a change.

Our class has finally joined the electronic age. The MIT Alumni/ae Association has set up an electronic mailing list for us that you may join by sending a message to [listserv@mitvma.mit.edu](mailto:listserv@mitvma.mit.edu) on the internet or to [listserv@mitvma](mailto:listserv@mitvma) on the Bitnet system. Your message should contain the line: SUB MIT1966. You may then send messages to other class members on the mailing list at [mit1966@mitvma.mit.edu](mailto:mit1966@mitvma.mit.edu). If you need help using the system there are instructions that can be downloaded once you are signed up.

Jeff Kenton, who nominally owns the list, can also help. He can be reached directly at [jkenton@world.std.com](mailto:jkenton@world.std.com). Jeff also writes that his girls are doing wonderfully and his software consulting business is improving with the New England economy. He has been "trading elbows on the basketball court" with another classmate, J. Miller Blew.

Looking forward to trading news with you on the e-mail system.—Eleanore Klepser, secretary, 84 Northledge Dr, Snyder NY 14226-4056, e-mail: [vismit66@ubvms.cc.buffalo.edu](mailto:vismit66@ubvms.cc.buffalo.edu)



Neil Slavin and Thomas Sciacca, both members of the Class of '68 with degrees in EECS, have designed the first cogeneration heating system expressly for residential use. Their "Intelligen" system is powered by an 11-horsepower diesel engine, producing electricity, heat, and hot water. The unit runs on No. 2 heating oil, like a standard furnace, and Slavin estimates that one gallon burned efficiently on site saves three gallons burned in a power plant. The initial cost of a unit is high—\$7,400 plus installation—but Slavin believes that the energy savings for a typical household could pay back the investment in as little as five years. What's more, since the units have a capacity that exceeds the demand in most households, the Intelligen can produce surplus electricity that the local utility is required by law to buy. A unit has been operating in Slavin's home in Groton for more than two years, and his electric bill dropped from \$85 for February 1991 to \$6 in February 1992. The partners have built ten units, of which nine are installed, and the only thing holding them back from production is investment capital.

## 67

After two years in Geneva, Switzerland, where Bradford Cross served as general secretary of the umbrella group representing the staff associations/unions of the United Nations specialized agencies, he and his wife, Janet, have returned to their regular jobs in the nuclear material safeguards area of the International Atomic Energy Agency in Vienna, Austria. . . . Mike Rosenblum started his own textile importing company in November 1991 and has survived his first year intact. . . . Ray Ferrara writes that he is working on a very interesting project for DEC, the "Information Manager," which allows access to and management of all the electronic information resources of an extended enterprise from a desktop client. The first customer shipments of this software product commenced recently.

Frederick Hottes continues in pathology in Salt Lake City, Utah. . . . David Garbin is one of three co-authors of the *Telecommunications Factbook*, published this year by McGraw-Hill. The book is a readable guide to successfully

managing and participating in the planning, acquisitions, operation, and control of major communications projects. . . . Joel Shwimer, our class treasurer, happily reports that our 25th Reunion cost our treasury only \$615, coming in well under our budget of \$2,000. Many thanks to John Rudy and his hard-working committee in the planning and execution of this very successful event.—Charlotte and Jim Swanson, co-secretaries, 878 Hoffman Terr., Los Altos, CA 94024

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By the time that you read this, our glorious 25th Reunion will have been history, yet due to deadlines it will be a month or two more before we can print details. So—we hope you had a great time.

Here's the news we received prior to the reunion. . . . Two years ago, George Owen settled down "happily" in the Milwaukee area where he is senior project manager for HNTB, a national architecture, engineering, and plan-



ning firm. . . . Douglas Goodman has been promoted to associate professor, with tenure, in the Department of Computer Science, University of South Dakota, Vermillion, S.D. His wife, Barbara, is an associate professor with tenure at the same university. . . . Back in Beantown, Aviva Brecher reports that "the life of a professional physicist in a two physicist family is very busy!" (Her husband, Ken, also graduated from Course VIII, in 1965.) They negotiate conferences and trips to be able to cover the home front. Their daughter will be entering college in September and their son is not far behind. Aviva organized a day long symposium at the Boston AAAS meeting in February on the Massachusetts Miracle and the Role of Technology in Competitiveness.

Since July 1991, Tomas Uribe-Mosquera has been Columbia's minister-counselor for trade and economic affairs to the EC, Belgium, and Luxembourg. . . . In the contest for the first child of a class member to go to the 'Tute, we have a bold entry from Hilarie Oman, '70 and Richard Schroepel whose daughter, Mercury, will be a senior in September. . . . While he didn't start with us in 1964, Richard Papenhausen moved into our class when he hung around an extra year to take an extra course in "English, of all things." He then got an MA and PhD in English from SUNY-Buffalo in 1970 and 1974. After teaching at several Canadian universities, he settled into a half academic/half administrative job at the University of New Brunswick in Saint John as director of student services in 1981. He has three sons, Aaron, 18, Brendan, 19, and Quentin, 14. His favorite hobby is chess, with sailing a close second.

After a tour in the Army and 10 years at the University of Michigan, Eric Sweetman settled down at AT&T Bell Labs in Princeton. He's happily married to Penelope, a writer, with a house by a canal, a dog, harpsichord, piano, and pedal organ. At 46, he's trying to learn to play the guitar. . . . Captain Jack Rector is stationed with the Naval Support Activity in Crete and is excused if he couldn't make it back to the reunion. . . . Terry Alden is a San Jose writer and lecturer whose interests span the natural sciences, metaphysics, and parapsychology. He has written documentaries for radio and television and produced planetarium programs. . . . As Far East marketing manager for Bell Helicopter, Lee Linthicum spends about a quarter of his time in China, Japan, Korea, and Taiwan, and would like to get in touch with classmates who live in those countries.

We are sad to report that Sandra Skiba died of breast cancer on October 13, 1990. She had graduated from the Harvard MBA program and at the time of her death was a PhD candidate in math at Washington University. She had served on the board of directors of St. Louis' New City School since 1988. She leaves her husband, David Crafts, daughter Anna, and son Bryan. Our sincere condolences to her family and friends. —Gail and Mike Marcus, secretaries, 8026 Cypress Grove Lane, Cabin John, MD 20818

## 69 25th Reunion

A dearth of notes this month. Steve Passage has bought a co-op on the Upper West Side of Manhattan. He is still president of Montanay Power Corp., an American subsidiary of a French conglomerate that operates and maintains municipal facilities. Steve writes, "The company has moved back into Manhattan and I no longer

have to reverse commute." . . . Stephen J. Schiffman has been granted tenure at Babson College in Wellesley and was promoted to associate professor of information systems in the Math Science Division. Steve joined the Babson faculty in 1986.

Thought for the Month, from the 17th Century wisdom of one of Galileo's tormentors, Francisco Sizzi: "Jupiter's moons are invisible to the naked eye and therefore can have no influence on the earth, and therefore would be useless, and therefore do not exist." Does that sound vaguely familiar?—Eugene F. Mallove, secretary, 171 Woodhill-Hooksett Rd., Bow, NH 03304

## 70

Rod Walker tells us that the company he helped start five years ago, Technology Solutions Co., now has nearly 400 employees nationwide and is a leader in client server systems integration for *Fortune* 100 companies. The company went public over a year and a half ago. Rod is living in St. Charles, Ill., with his wife and children—two sons, 7 and 8, and a daughter, 3. We hope everyone is having a good summer.—Greg and Karen Arenson, secretaries, 125 W. 76th St., Apt. 2A, New York, NY 10023

## 71

It is my sad duty to note that Dana Pettengil died because of a complication from a heart stoppage more than a year ago. Dana received BS and MS degrees in Course X. He lettered in sailing and was an active member of the Tech Model Railroad Club and Alpha Phi Omega. After graduation he served with the Navy as an engineering officer aboard the USS *Tripoli* during the Vietnam War and completed two tours of duty in Vietnam before his discharge as a lieutenant, senior grade. He was employed for the past five or six years as a senior research engineer for Lifescan, a California subsidiary of Johnson & Johnson in Mountainview, Calif. He was a member of the Golden Gate and Richmond Yacht Club, and past commodore of the Golden Gate Club. He served on the appeals committee of the Yacht Racing Association of San Francisco Bay and as national class secretary of the International 10-Square-Meter Sailing Canoe. He participated in international and national championship regattas in the sailing canoe and thunderbird classes. He danced with the Berkeley Morris and Sword and was an Irish fiddler. He is survived by his wife, Nancy Pettengil, his parents, Kenneth and Emma Pettengil, four brothers, two sisters, and many nieces, nephews, aunt, uncles, cousins, and friends.

Charles E. Blair writes: "Got married last September. Have given up bridge for chess (less stressful). Messing around with UNIX and (illegible). Try to write a paper occasionally." Please send your notes to: R. Hal Moorman, secretary, P.O. Box 1808, Brenham, TX 77834-1808

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As I write this it is St. Patrick's Day, and I mention it to give you an idea of the long lead time on this column. But on to news now! Having said that I must add to a prior column. . . . Richard Pini, the publishing micro-mogul, has

supplied me with the name of the great comic that he and Wendy publish. It is *Elfquest*. Since the reunion, the business has expanded by adding two full-time employees in addition to the dozen and a half free-lance artists and writers they use to put out their interesting comic books. And in a sign of continuing growth near year end, they signed a representation agreement with Creative Artists Agency. With a bit of luck we may be seeing them in the Saturday morning cartoons in a few years. Needless to say, they are "having the time of our lives" at Warp Graphics.

Larry Klein's wife got him to send news, for which I am grateful. He is in private practice of internal medicine in Washington, D.C. He is also currently the VP of the D.C. chapter of the American Society of Internal Medicine and has been a national delegate to several of the society's annual legislative meetings. Larry is on the faculties of both the Johns Hopkins and Georgetown Schools of Medicine in addition to his private practice. He continues to be involved in research into the Medication Problems Among the Elderly and was invited to participate in a recent consensus conference held at Harvard. In his "spare time," Larry is delightfully married and the father of a 3-year-old with another child on the way. Larry would like to hear from his former roommate Phil Burke and wants his new address.

Lt. Col. James A. Mosora is currently working at SDIO on defense acquisition policy and operations. He finds that he is sharing the Pentagon with Rich Gibson, who is at USAF Studies and Analyses. . . . Ronald Mark Hollander is currently executive VP and COO of Massachusetts General Hospital. He and wife Tory are living in Newton, Mass., with four children ranging in age from 1 to 14.

Please send your additional news to either Dick or me, or the Institute. Please note that I have moved; the street address is the same, but the apartment number is now 1001.—Wendy Elaine Erb, co-secretary, 6001 Pelican Bay Blvd., Apt. 1001, Naples, FL 33963; Dick Fletcher Jr., 135 West St., Braintree, MA 02184

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William Dannelly joined the law firm of Hunton and Williams last April, and now takes up residence in their Raleigh office. . . . Steve Warsof has left Chicago after a "disastrous" two years and has relocated back East to Virginia Beach, Va. Anybody know someone who wants to buy a house in Hyde Park?

Michael Knauer writes of being in his 20th year at Digital and having thus far survived the corporate downsizing. He is the Alpha AXP consulting service manager for the United States. Kathy and he have three great kids, Kate ('98), a senior and MVP on the field hockey team, Tom ('01), a freshman starter on the JV soccer team, and Carrie ('05), fifth-ranked figure skater in New England last year, skating at the novice level. All, he adds, are good students, too. Finally, Keith Garel notes he and wife, Margareth, are happily married with one child, working at Ontario Hydro providing safety and licensing support to eight reactors at Pickering Nuclear Station.

My sons, Eric and JR, are busily finishing college freshman year and sixth grade, respectively. At the end of this summer, Eric moves out for good and it will be a mildly quieter place, no doubt. JR has made second-class scout and is enjoying camping, canoeing, fishing, and the like. I should have been up to Cambridge for the reunion with Ruth when this is printed.



# Environmentally Friendly Design: A Modern Homage to An Ancient Culture

When Marc Rosenbaum, '74, SM '75, and his associates won the contract to design a tribal headquarters for the Wampanoag Indians at Gay Head, Martha's Vineyard, they found themselves working for a tribe whose ethic of environmental sustainability meshed happily with their own professional focus.

Rosenbaum, a mechanical engineer, is principal at Energysmiths, his New Hampshire company that designs environmentally sound homes. In order to bid on the project, he joined forces with two like-minded colleagues to form Arc Design Group. They designed the new center, and the company is now supervising the construction.

At first glance, their building does not look particularly Native American. Arc Design has subtly woven traditional Wampanoag pottery iconography into features of the building—the entry, railings, and shingle band. But the shingling and roof pitch, which are typical of the present coastal building style, are appropriate, Rosenbaum explains, for a people who are now integrated into modern culture.

The chief tribute to the culture of the Wampanoags, however, is the building's relationship to the environment. Heat and light from the sun are maximized by the elongated east-west axis and by positioning 65 percent of the windows on the south side. The building is set into a

south-facing slope with a single floor rising above ground on the north entrance, thereby reducing peak heating and cooling loads. Airtightness and an unbroken insulation barrier will also keep heat demands low.

Mindful that office buildings often spend more on electricity than heat, the building was carefully designed for maximum natural daylight. Rosenbaum and his colleagues tested their lighting concept in a model of the building, so they could make any necessary changes to reduce glare or illuminate hard-to-reach places before construction began. Further, a control system will dim electric lighting as ambient light levels rise.

The headquarters includes other environmentally friendly features as well. A ventilation system will recover heat from exhaust air. Human wastes and greywater will be composted and treated within the building, producing compost and water that will be used for plants, both indoors and out. Building materials were chosen for low toxicity (e.g., water-based polyurethane) and resource efficiency; these include ceramic tiles recycled from auto windshields, carpeting from plastic milk containers, and insulation and carpet underlay (commonly a toxic particle board) from recycled newspapers.

The building is well underway (see photo below) and Rosenbaum expects it to be completed by the end of this year.

—Susanne Fairclough □

Hope we all enjoyed ourselves. Write!—Robert M.O. Sutton, Sr., secretary, "Chapel Hill," 1302 Churchill Ct., Marshall, VA 22115

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# 20th Reunion

Ah, July. For those of you still converting from 39 to the next number, remember, you're not forty, you're thirty-ten! Lots of news for this column. First, there's me. In March I took off my programming T-shirt, got a haircut, bought a closet full of suits, and am now sales and marketing director for Omnet, Inc., in Newton, Mass. Omnet is a networking services company with products that help people collaborate. The people at the new job are great, the product is a stunner, and the future's so bright I gotta wear shades.

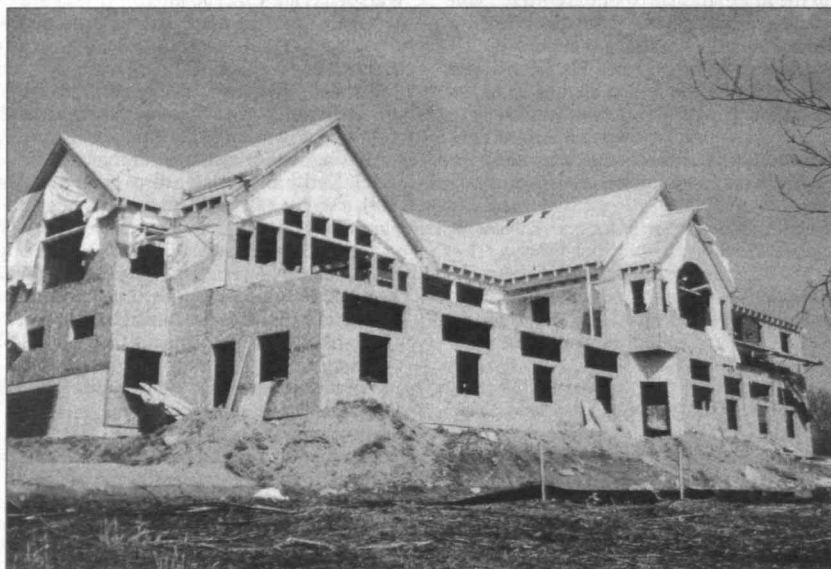
The MIT Student Financial Aid Office wants you to know how grateful they, and the recipients of the Class of 1974 Scholarships, are for yet another year of your generous support. Andrew Lan and Eleni Kapogiannis are both seniors this year and doing well both academically and outside of class. Both students have been receiving scholarship funds for at least two years from Class of 1974 giving, based on financial need.

By the time you read this it will be too late to attend the first meeting of the 1994 Reunion Committee, but mark your calendars for the first weekend in June 1994, our Twentieth.

Professor Frank Morgan received the Mathematical Association of America's Distinguished University Teaching Award for excellence in teaching mathematics. Frank teaches at Williams College where he recently said, "People love to find they can appreciate mathematics." ... Scott Shlecter was recently named CEO, U.S. operations, for LEK Consulting, Inc., in Boston. ... "I am currently an astronomer at NASA's Goddard Space Flight Center," writes Randy Kimble, "working on an advanced spectrograph for the infamous Hubble Space Telescope." Randy and Mary Ann Wilson celebrated their 10th anniversary in April. Their daughters Katie and Elizabeth "keep things hopping." ... Speaking of keeping things hopping, Jeffrey Weinreb turned 40, married Dr. Risa Kent, and ran in the New York Marathon all this year.

After four years of running the high definition systems program at DARPA, Marko Slusarczyk is moving to Ann Arbor, Mich., to become VP at USP Holdings, a company specializing in transferring technology from institutes in Ukraine and Russia to the United States. ... John Black says "greetings" to his Course III compatriots from the wilds of Pittsburgh. He's alive, well, and working for Alcoa in their Strategic Planning Department. ... Tom Wolff writes that he is "very satisfied and challenged by my 'new' career as a chemical information specialist." He's just returned from France where he spoke as an invited speaker at the Montreux International Chemical Information conference.

Your faithful scribe had a bit of trouble reading the handwritten note from Ed Ringel. What I thought Ed said was: "I'm worried and have two daughters," but after staring at it I realized what he really said was: "I'm married and have two daughters." Perhaps the two meanings are not dissimilar. Ed's been living in Waterville, Maine, for seven years now, practicing pulmonary and critical care medicine. He says it's quite a change from life in Brooklyn but now he's probably better with a chain saw than getting on and off a subway. "It took us a while to get used to life up here but we would not





change it for anything at this point."

We'll close this month with a tip of the pen to **Janice Benson**. "I continue to cause minor 'trouble' by doing such radical things as working to improve health care in Chicago for underserved people in poverty. I would love to hear what other old 'rads' are doing now. Any other members of the 1972 Spring Collective out there?"

Of course, in 1993 the term "Spring Collective" probably has something to do with recycling mattresses. Keep the spring in your step.—**Lionel Goulet**, co-secretary, 115 Albemarle Rd., Waltham, MA 02154-8133, (617) 899-9694, fax: (617) 969-9562

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Please send news for this column to: **Jennifer Gordon**, secretary, c/o Pennie & Edmonds, 1155 Avenue of the Americas, New York, NY 10036; or 18 Montgomery Place, Brooklyn, NY 11215

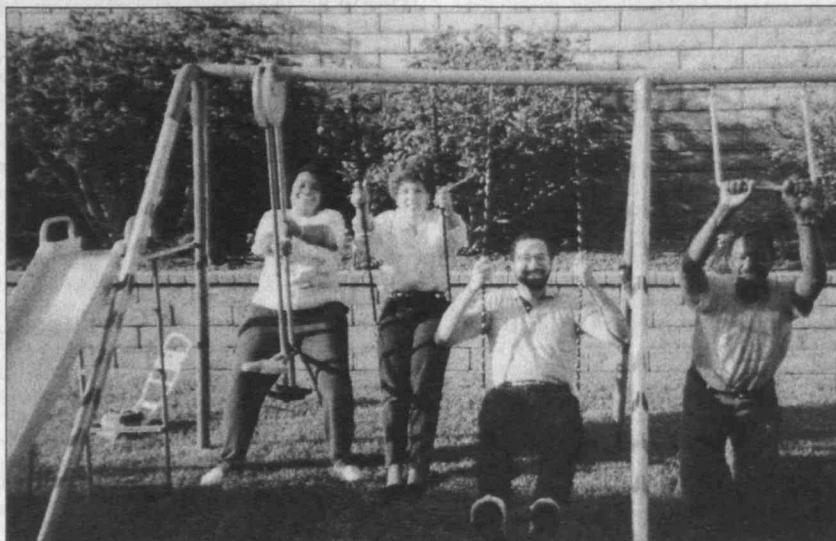
## 76

Please send news. We need it; very little has come in.

From **David Maass**: "Eleven years after starting Advanced Composite Products, I am still challenged and enjoy running it. Spend the rest of my time with Lisa, Eric (9), and Evan (4) doing the usual family activities—fishing hiking, skiing, soccer, etc. Have been fortunate to have seen many classmates during the past year—**Carl Young**, **Ed Crawley**, **Mike Graves**, **Sue Riedel**, and **Fred Tsuchiya**." . . . **Steve McConnell** writes, "I don't have much news. I still have [carpal tunnel syndrome] problems with both hands—bad enough that I can't type, but not so bad that surgery has been indicated. Dictating C and C++ code to a typist is rather slow (for me) and painful (for the typist)!"

Word from **Mike McNamee**: "After a long drought, I have news on three fronts: personal, professional, and Institute. I'm writing from home on the one-week anniversary of the birth of my daughter and second child. She's almost as long as her name—**Grace Virginia Taylor McNamee**—and she is working hard to live up to the title she won in the hospital, 'Hungriest Baby in the Nursery.' All of us—my wife, **Karla Taylor**, my son, **Elliott**, who is 6, and myself—are thrilled to have a little girl. At work, I took on a new beat January 4: health care. I figured that my editors at *Business Week* decided that the health business was the only topic more complicated than my previous beat (the Federal Reserve and international economics). With **Hillary Rodham Clinton's** task force hard at work, and all the interests in this \$835 billion industry gearing up for the lobbying battles ahead, I expect an exciting year or two. Finally, I haven't seen any mention [secretary's note: No one told me!] in *Technology Review* of the informal reunion of mid-70's *The Tech* alumni last September. The affair was organized by classmate **John Hanzel** and **Barb Moore**, '75, **Norm Sandler**, '75, and **Paul Schindler**, '74. We had almost 30 former editors, photographers, and production editors at a Friday-night reception, and a handful of diehards stayed on to party into Sunday."

As for your secretary, he continues to trade. Each year, and each new administration, bring yet a new round of instabilities in the markets. These unstable times are the very best of times



**HOW THE SEVENTY-EIGHTERS TRAIN:** (From left) **Cordelia Price**, **Leslye (Miller) Fraser**, **A. David Stuart**, and **Vincent James** during their daily gymnastics regimen at the Fraser household in Los Angeles during a recent visit.

for trading and the very worst of times for policy makers. Since I do not have a policy-making role, it appears that I am destined to continue to exploit the efforts of those who do! It is far more satisfying than gnashing one's teeth over policies with which one disagrees. The computer and telecommunications side of your secretary's business life continue to provide a retreat from the stresses of trading. Later this year I may be launching a fax-on-demand publishing business. More on it later if it develops, as I expect it will.

Please write, fax, or call. We need your news.—**Arthur J. Carp**, secretary, Quantalytics, Inc., 220 Henley Rd., Woodmere, NY 11598-2523, (516) 295-3632, fax (516) 295-3230

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Please send news for this column to: **Ninamarie Maragioglio**, secretary, 8459 Yellow Leaf Ct., Springfield, VA 22153, (hertz@xip.nrl.navy.mil)

## 78

At this writing (late March), we are anticipating our 15th Reunion, which by now should be a happy memory for all of you who attended.

Brief notes sent along with reunion responses give us the following news: **John Richardson** writes, "My wife (Jo Landerfeld) and I moved to Portland, Ore., (home for me) in January as I started working for Intel in their Software Technology Group. We just purchased a 1910 'craftsman' home that we love, but it needs some work." . . . **Janet (McCleary) Schaab** sends us news from Tom Bean, Tex. (!): **Kathryn Nicole** was born on May 12, 1992. She joined Derek who is now 9 and Kristen, who was 3 in March. Everyone is fine, and we are still home-schooling Derek." . . . **Mike Geselowitz** informs us that his third child, **Israel Rashi Geselowitz**, was born in November 1992. The ever-growing Geselowitz household

lives in Cambridge.

**Steve Stein** writes from Rutland, Vt.: "**Neal Rockowitz** just visited with his son for a few days of skiing—in the rain, unfortunately. I saw **Gene Henschel** and **Mike Ries**, among many other Lambda Chis, at Don Williams, '79, wedding this past fall. I hope our pledge class can find time for our own reunion this June!" . . . **Steve Fairfax** tells us he is still at MIT as head of engineering for the Alcator Project. Steve lives in Lincoln, Mass. . . . **Rich Perlstein** writes from his villa in Corte Madera, Calif.: "**Michael Horner Perlstein** was born in October 1991. At 14 months, he's an extremely cheerful little guy; Susan and I love the parenting role."

**David Blaker** writes from Emmaus, Pa., (home of the late Robert Rodale's companies, which promote and publish books and periodicals about, among other things, organic and sustainable agriculture): "My family and I returned to Pennsylvania last year from a three-year stay in England. Our third child was born there. Looking forward to meeting fellow Bakerites at the reunion."

We received a lovely letter from **Leslye (Miller) Fraser**: "I'm doing pretty well out here in Los Angeles. My husband, **Darryl M. Fraser**, '80, and I have two children: **Brittney**, age 6, and **Michael**, age 4. I've just completed a career change. After nine years in aerospace as a research engineer, section manager, and then project manager (along the way, I was a co-inventor on a U.S. patent for an advanced elastomeric material), I decided to go to law school. With much support from Darryl, I graduated in May 1992 from UCLA School of Law, Order of the Coif. I passed the California Bar in July (the worst experience in life, including childbirth), and now am an associate attorney with the firm of **Gibson, Dunn & Crutcher**, concentrating primarily in labor law.

"Our esteemed classmates, **Vincent James**, **Cordelia M. Price**, and **A. David Stuart** visited Hong Kong together this past summer. On the way back, they stopped by to say hello and play on our jungle gym in the backyard. (It was a rough week!) **Dave**, **Darryl**, and I still are actively recruiting students of color for MIT admission in the Los Angeles inner-city



schools."

Leslye notes that it doesn't seem like almost 20 years have passed since she lived in East Campus down the hall from Diane Curtis.

As you read this, a veritable bounty of organically-grown produce should be coming forth from our farm. For consumers, "organically grown" means containing no pesticides, fungicides, or fumigants, many of which are present in the food purchased at your supermarket with no labels or warnings required. For the community, "organically grown" means low dependence on petroleum and petroleum-based products. Organic agriculture practices are sustainable for many generations, and preserve genetic diversity through use of a wide variety of seed sources.

Send us your news today!—Jim Bidigare, secretary, 9095 North Street Rd., NW, Newark, OH 43055-9538, (614) 745-2676

## 79 15th Reunion

Got a nice long letter from Beth Marcus, who writes, "Over the last year I have been very busy building EXOS, the company I founded four years ago. Our core product is the Clinical HandMaster system, which is shipping three systems per week and is on its way up. We now have a Mac and a PC Windows version. In R&D, we have two NASA projects on force feedback exoskeletal controls for robots and virtual reality, and are working on an OEM product less invasive surgery using this technology. In 1992, we did approximately \$1 million in revenue, and are on our way to \$3 million in 1993. The company now has 22 full-time employees and is projected to grow to 50 by the end of the year. This year I will finally be able to delegate many of the duties I don't enjoy, and concentrate on my strategic and technical strengths. The company is hiring technical people of all sorts, and some business and marketing people, so if you're interested or know someone suitable, contact me at EXOS, Inc., 2A Gill St., Woburn, MA 01801.

"On the personal front, '92 was a great year to be through. I recovered from back injuries and Graves' disease. I feel great and have an energy level I haven't seen for several years. I've been cross-country skiing now that we have enough snow. I have a cock-a-poo puppy named Luke who is cute, lots of fun, and is keeping me on my toes with his antics. He's currently working on standing on his hind legs and walking (I'm not teaching him—he just likes to do it!), and turning the door knob with his paws (he's been successful once!)."

Todd Peltzer had a busy year last year. In a six-month period, he and his wife adopted baby Nicole (born June 26, 1992), relocated from Hawaii to Virginia, and bought a brand-new townhouse in Alexandria. Todd is working at Naval Sea Systems Command headquarters in the office of the supervisor of Diving and Salvage. . . . Peter Osterberg returned to MIT in September 1991 to pursue a PhD in electrical engineering and computer science after 12 years in the industry. He is working in MTL under Professor Steve Senturia in the area of silicon micro-machining.

Kevin Trammel was named manager of business development for Pratt & Whitney's overhaul and repair organization. He and his wife, Denise, have a 15-month-old daughter named Cassandra Jeanne. . . . For the last two years, Tobias Orloff has owned and operated Minerva Software, Inc., a Minneapolis-based company writing software for high-end 3D computer animation.

Your faithful secretary is deep in the world of Off-Off-Broadway once again, playing the lead in the 1930s Rodgers & Hart musical, *The Boys from Syracuse*. It's got a goofy plot (based on Shakespeare's *A Comedy of Errors*, replete with two sets of twins and lots of mistaken identities), but I get to sing some wonderful songs, including "Falling in Love with Love" and "Sing for Your Supper."—Sharon Lowenheim, secretary, 98-30 67 Avenue, Apt. 6E, Forest Hills, NY 11374

## 80

Steve Mickel called to let me know he, his wife Elaine, daughter Allison (4), and son Scott (1) are all settled in Ann Arbor. Steve had called me a year ago when he moved here but his family was still in Maryland. He is a marketing manager at Mallinckrodt Sensor Systems, which



Michele Piccone

specializes in blood chemistry analyzers. Steve is very interested in getting together with other alumni/ae in the Detroit/Ann Arbor area. . . . Michele Renee Piccone, MD, recently joined the faculty at Scheie Eye Institute as an assistant professor of ophthalmology. The institute is the Department of Ophthalmology for the University of Pennsylvania School of Medicine and Presbyterian Medical Center of Philadelphia. After leaving MIT, Michele graduated from Albany Medical College of Union University. She completed a research fellowship at Scheie in 1987 and her residency in ophthalmology in 1990; also at Scheie. She lives with her husband, William Miller, and two sons in Philadelphia. . . . Another classmate has moved to Texas. Robert White left Digital Equipment after 12 years (with a very nice severance package!) to take a job at AT&T Bell Labs in Mesquite.

In February, Amy Plotnick wrote, "It is with great sadness that I have to inform you of the death of my husband, David Plotnick. He fought a tough battle with cancer for over six years. David worked in health care since leaving MIT, in Washington, D.C.; Phoenix, Ariz.; and Columbia, Md. Through his work in research and statistics, he touched many lives and worked to help people with low incomes receive health care. We met at Marlon Weiss's wedding, where we were paired as bridesmaid and groomsman and fell in love! We were both at the 10th Reunion, and he was so proud of his school. He also conducted interviews for high school students, in Phoenix, who wanted to attend MIT. He contributed to the school often and to the Hillel on campus. David was a wonderful husband, devoted son, and loving brother. There were close to 400 people at his funeral from all over the country. He was a truly gentle man whom I miss greatly." . . . Our condolences to Amy and the rest of David's family.

By the time you read this, my husband and I should be finalizing our plans to move into our new home in Canton, Mich. (about 15 miles east of Ann Arbor). The house is under construction, and we are very excited about our first house!

Please send your news to: Kim Zaugg, secretary, 2384 Leslie Circle, Ann Arbor, MI 48105, (313) 665-2365, vayda@erim.org.

## 81

I finally relocated some news that came my way in the midst of my move last November. Sackcloth and ashes for me. . . . *Inside the Beltway*: Daniel Packer informs us that he moved from California to Washington, D.C., in 1991 to work for Fannie Mae. He was awarded a 1991 Chairman's Award for significant contributions to Fannie Mae, and is currently a director of systems development, specializing in risk management systems. . . . *In India's sunny clime*: George Erickson received a Fulbright Scholarship for 1992-93 and is presently doing field research for his doctorate in anthropology in Palitana, Gujarat, India. . . . *New York development*: Susan Fine has moved from Olympia & York, where she was formerly a VP to a new position as real estate director of the Metropolitan Transportation Authority in New York City. The MTA is involved with the planning of every large project in the Big Apple due to their impact on transportation. The MTA also does its own development projects, and Susan hopes to implement one of these projects, a \$500 million renovation of Grand Central Terminal.

*Promoted*: Stephen Probst is now a senior associate with Charles River Associates in Boston. . . . *Licensed*: Victor Miller lets us know that he has received his P.E. license from New York state and continues to work as a systems engineer for Loral Electronics in Yonkers, N.Y. . . . *Teaching*: Rosemarie Wesson Williams tells us that she's moved to the Department of Chemical Engineering at Louisiana State University, where she's been an assistant professor for a little over two years. Prior to that, Rosemarie was with Dow Chemical for five years. She and her husband, Billy, are expecting their second child this month, to join their daughter Ashley, who turned 3 this past June.

*Proud father*: Speaking of children, Thomas Sample informs us of the birth last December of daughter Alana. Thomas is still doing chemistry for Shell Oil in Houston and makes about four trips per year back to New England. According to Thomas, summers on the Cape are much better than summers in Texas. He plans to meet in Chicago this August with Peter Jernakoff and Kevin Bowie. . . . *There you go again*: Yours truly has pulled up stakes and moved once more. This time, I've returned at long last to sunny southern California. I've changed firms and am now working with Spensley Horn Jubas & Lubitz, an intellectual property firm in Century City, on the west side of L.A. Don't know where I'll be living as of yet, so I'm staying with my parents for the time being.

Hope your summer is enjoyable. Let us know how you're doing.—Mike Gerardi, secretary, 3372 Olive St., Huntington Park, CA 90255, (213) 587-2929

## 82

Those who ordered class directories should have received them by now. It seems that the best way for the class to communicate via e-mail is to use the established national networks (internet, CompuServe, America Online, etc.). E-mail addresses are included in the class directory.

Evan Morris writes that after nine years of exile in Cleveland he returned to Boston this fall for a research fellowship in PET imaging at Mass. General. He and his wife, Adele Merrenstein, bought a house in W. Roxbury and man-



aged to find NoName restaurant without too much difficulty the first weekend they were back in town. Guess it's like riding a bicycle. He can't get over the mass of drivers going 70 mph in the breakdown lane of Rte. 128. . . . **Elena Ruzier-Gearing** got married May 30, 1992, to John Gearing, a fellow Lockheed employee. The wedding was in Riverton, Wyo., and **Michelle Gabriel** was maid of honor. . . . **Louis Konopelski** is presently the computer teacher at Salesian High School in New Rochelle, N.Y.

**Eduardo Torres** is still single and still working on his quest to play the top 100 golf courses in the world. Recently he played Teeth of the Dog, a course in the Dominican Republic. . . . **Jason Kaldis** and his wife, Laile Giansetto, enjoyed the reunion thoroughly. They especially enjoyed meeting classmates they didn't know well in school. They were glad to have made some new friends and to have met so many spouses and children. The reunion capped their domestic honeymoon. They will be taking their foreign honeymoon in Argentina in the spring. Hope we see some class notes upon their return.

Babies, babies, babies. . . . **Kathy Hsu** and husband, Greg Burroughs are please to announce the birth of their son, Nathan Wen-Liang Burroughs on November 30, 1992. . . . **Nicholas James Olivo** was born on October 17, 1992, to Susan and **James Olivo**. He weighed in at a happy and healthy 6 lbs., 7 oz. . . . **Angela Liao Urdanoff** worked for General Electric for 10 years in the plastics division. She currently is marketing high performance thermoplastics in the Midwest. Her husband, Steve, is working for the competition, DSM Engineering Plastics, as a product manager. She is pregnant with her first child. . . . **Michael Post** added a fourth child to his family, a baby girl, born December 1992. He and his wife, Anne, figure that with two cats and four kids enough is enough! Michael is still working for Westinghouse MTD and has some interesting data acquisition and condition-based maintenance projects coming down the line in 1993. He visited former MacGregor neighbor, Mike Gherrity, '81, a couple of times this past year and went to a Star Trek convention in San Diego with him and his wife, Ellen Caprio.

**David Shapiro** finished a PhD in statistics at Stanford in January. He will be doing a postdoc fellowship in biostatistics at the University of Rochester (N.Y.) Medical Center or possibly at the Harvard School of Public Health, starting this spring. On the way there, he plans to spend as much time as possible in Boulder, Colo., visiting Ted Weaver, '83, and Patti Million and their 4-year-old son, Sam. . . . **Christopher King** is living in Florence, S.C., with his wife Karen (Northeastern '81) and two children, Christopher, 9, and Melissa, 6. He works as an advanced projects engineer for GE Medical Systems on superconducting magnets for magnetic resonance imaging (MRI) systems. . . . **Stephanie Wingfield** is currently architect-in-residence at Massachusetts College of Art overseeing a \$16-million campus renovation. She recently opened a show titled photographs from West Africa and gave a cello recital at MIT last June. She is still living in the Boston area.

**Joe Kesselman** survived a summer of 72-hour weeks in sunny Seville, as a member of the team that developed, installed, maintained, and extended IBMs distributed pavillion for EXPO 92, a system of 231 touch-screen multimedia stations offering everything from voice mail between visitors to fully automated restaurant reservations to the most ambitious electronic magazine yet attempted in Spain. Would you believe *two billion* interactions during the six months of the world's fair? Just a small test case

for a new application development approach IBM research is working on. . . . **Brett Boal** writes that he has a new baby girl, Nina, and a new job as director of PC services and MIS planning for Sony Music Entertainment in New York. . . . **Marie-Louise Murville** is working at Charles River Ventures in Boston, which invests in early stage software, communications, health care, and environmental companies. Send her your business plans!

**Pat Cullen** writes that she and her husband, Scott, and their golden retriever, Rusty, moved out to the wine country (Santa Rosa, Calif.) for a year and worked for the Microwave Technology Division of HP, on gallium arsenide chips, as well as wine tasting. Then they relocated back to Ft. Collins, Colo., again both with HP. Pat has become a solder metallurgist in a packaging and surface mount technology group. They have plans to meet **Betsy Komives** in Denver when the Pope comes to town for World Youth Day! Betsy is a professor of chemistry at UC/San Diego.

This is old news, but I just got notification that **Robert Weinstein** passed away in January 1986. . . . I hope to have more news next time. Over and out.—**Helen (Fray) Fanucci**, 502 Valley Forge Way, Campbell, CA 95008

## 83

In the next issue we will report on our 10th Reunion, including the results of elections for those all-important class officers, including the highly coveted office of class secretary.

**Cindy Pribble** writes that she and husband, Greg Kochanski, '82, have had a very busy year. Cindy has been traveling extensively in Europe as part of her manufacturing systems

job at Bristol Myers-Squibb. Greg has been publishing (not perishing) with AT&T Bell Labs. Cindy and Greg are still remodeling their house in central Dunnellen, New Jersey, and welcome MIT visitors, especially those skilled in carpentry and plumbing. . . . **Norman Hunt** just bought a new house and is slowly settling in. Norman is working as president of Sonex Corp., a traffic control systems company in Philadelphia.

**Stephen Michael Johnson** writes that he is continuing his mountaineering goals—he has climbed Devil's Tower, Wyoming, and the Grand Teton this past summer. . . . Another mountaineer, **Ken Krugler**, has decided to climb the even bigger mountain of marriage. Ken is engaged to **Chris Duff**, a Harvard, Mass., native, who shares Ken's interests in hiking and software. A September wedding is planned.

**Eric Bier** writes that he has emerged from an early-thirties identity crisis and is enjoying lots of evenings at home. Eric, who has recently joined a men's group and a church, has discovered the joy that comes from simple things like walks, nature, children, friends, and quiet.

Finally, I received a newspaper article on Shiva Corp., whose president, **Dan Schwinn**, is one of the more successful entrepreneurs in our class. Shiva makes a remote networking system that enables telecommuting to become widely available, and is currently \$30 million in revenue. The company was listed as No. 25 on the most recent *Inc.* 500 list of fastest growing private companies. With 130 employees, Shiva is now starting to recruit senior executives from major computer companies. Thirty to fifty new employees will be added this year, so those of you who are getting the 10-year itch might get your resumes ready.—**Jonathan Goldstein**, secretary, c/o TA Associates, 45 Milk St., Boston, MA 02109, Fax (617) 574-6789

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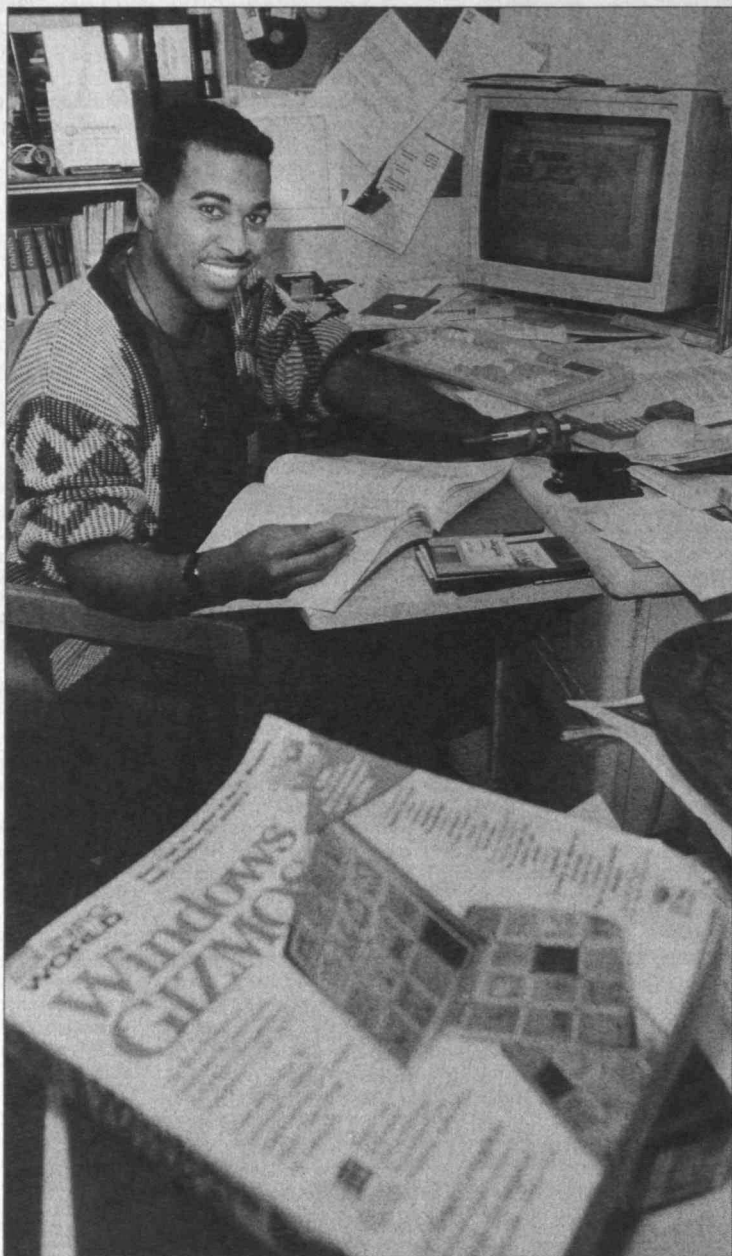


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*As a disc jockey at MIT's WMBR, Ken Granderson, '85, was interested in music programming, not computer programming. A major in electrical engineering, he studied electronics to help him improve the equipment at the station.*

*But after he graduated and earned enough money to buy himself a computer, he taught himself programming. In 1991, he wrote his first computer program and shortly thereafter formed his own business, Inner-City Software, based in his living room in Boston's South End.*

*Granderson's latest program, Group Icon, was featured in Windows Gizmos, a collection of new programs by 25 independents. It helps people with IBM compatible computers organize their files. Users can assign an image of their own choice instead of a uniform box to each collection of files, enhancing subject identification. Granderson, interviewed for the South End News, said: "It's a simple little thing—you're not going to die if you don't have it." The \$20 price makes it attractive. "The idea was to sell it real cheap, so people won't hesitate to buy it." So far he's sold 700 copies throughout the world.*

**Wean Khing Wong** was promoted to senior patent attorney of Abbott Labs, Ill. She is engaged to Mark Scollar, SM '85, who is a scientist at Abbott. Mark is finishing an MBA this year. Their wedding plans are moving ahead slowly, but it will be in September in a Buddhist temple in Los Angeles. Wean Khing's family lives in Malaysia, and Mark's family lives in Germany.

**Barry Surman** sent some e-mail: "I'm putting away my reporter's notebook and starting a new career later this year as a management consultant. Since I discovered the joy of journalism at *The Tech*, I have covered everything from prison riots to politics—they're not much different, really—as a reporter for the *Los Angeles Times* and later for *Congressional Quarterly*. In between, I served as press secretary in Senator Paul Simon's 1988 presidential campaign. After covering Capitol Hill for three years, I'd had enough of both politics and the press, so I decided to go back to school. The best part of being a student again has been the vacations. During breaks in my program at Columbia Business School, I have traveled in Brazil, Chile, Greece, Russia, the Czech Republic (a few days after the Slovak secession), and Hungary. Japan is next on the itinerary, after finals this spring. The worst part of my return to academia has been the commute: I've been shuttling

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### 10th Reunion

**Stephanie Oberg** married David Nabors in December 1989, and last November Annika Joy Nabors was born. Turns out they are neighbors of mine living in Bedford, Mass. Stephanie works for Thinking Machines in Cambridge, and David works for Lincoln Labs (you can never really leave MIT). . . . **Philip Soo** reports a significant milestone—he has finished paying his student loans. He is doing free-lance contract work and putts around his garden in his free time.

**Preston Kemp** became a design/project engineer in the truck tire development group at Michelin last November. Paraphrasing a former aerospace engineer, Preston says: "Tire design isn't exactly rocket science; it's much more difficult." . . . **Peter LeMessurier** recently started LeMessurier Energy Services after working for others in the energy conservation

field for seven years. Peter's goals are to provide a higher level of quality, service, and integrity than is usually found in the energy services industry. (Sounds like Peter has some stories to tell, but can he tell them without being sued? Watch for the book.)

**Jerry Smith** is at the University of Colorado at Boulder and has the enviable problem of balancing his research and the ski slopes next door. He got a master's degree in aerospace engineering last fall and just passed PhD prelims. Time to buckle down and forsake the ski slopes a bit. Jerry says its tough being a poor graduate student again but the academics and recreation make it well worthwhile.

**Lisa Tener** has been working for over two years as director of "The Hospitality Program," a non-profit organization that provides temporary housing for families of patients who come from out of town for medical treatment in Boston. Two of their volunteer hosts are MIT affiliates: Tom Markert, PhD '75, a research scientist at CSR, and Claire Moore, '74.

between New York and Washington, where my wife, Callie Pappas, is an international trade attorney. After I receive an MBA this May, I'll be going home for a summer of balcony gardening and whitewater rafting; in the fall, I will join the Washington office of McKinsey and Company."—**Howard Reubenstein**, secretary, 28 Mitchell Grant Way, Bedford, MA 01730, (617) 275-0213 (home), hbr@mitre.org

## 85

Greetings everyone. It is nice to be back at a computer so I can keep up with *Review* deadlines. The absence of a column or two prompted a couple of classmates to submit news just to make sure that it doesn't happen again.

First, a correction: I am happy to report that **Dimitri Kazarinoff** is alive and well, contrary to the death notice I received for the May/June



issue. Dimitri is living in Farmington Hills, Mich., with his wife, Mary Struble, and their two children. . . . **Steve Scherdin**, former swimmer, writes from Kentucky: "I'm working on an MBA full time at University of Louisville. I was having so much fun juggling part-time MBA work with full-time engineering that I decided to finish the MBA. I also have a graduate assistantship with the Telecommunications Research Center at U of L. It is a joint effort between South Central Bell, the state of Kentucky, and U of L, which looks at ways that some of the emerging technologies can be used to strengthen the economy in Kentucky. It's been pretty exciting, and it keeps my hands in some of the technology while I finish the MBA. I plan to finish in December and then move on to bigger and better things. . . if I can only find where those bigger and better things are." . . . **Althea Haylett**, from sunny Orange, Tex., where she's doing her third assignment in Du Pont's field program, writes: "Although Texas has taken some getting used to, I was very happy to be there when the rest of the country was overcome by snow. After returning from Japan—with **Suresh Srinivasan**, **Dalton Chen**, **Lauren Barrett**, and **Dennis Ward**—I completed an MS at Columbia University in 1988 while working at the EPA. When I'm bogged down in environmental research, I call **X. Kevin Marshal**, who does environmental consulting, also at Du Pont in Houston. **Yancy Dennis** (PhD, University of Virginia, 1990) is also part of the Du Pont world and is called on frequently for his insights. Althea and Kevin teamed up with **Chiquita White** in Beaumont, Tex., recently while she was visiting, doing her usual company travels for Procter and Gamble. This group of Course X graduates joined another chemical engineer, **Rodney Rhodes** (Althea's husband), for lots of exciting activities at their home in Beaumont. They took the opportunity to call **Pam Givens**, who's on temporary assignment in England. But, the highlight of the weekend was seeing Althea in a motherly role with her 8-month-old son Alex, who's having so much fun tearing things apart it's suspected that he's a future mechanical engineer."

**Kate (Laffey) Martin** is working for Xerox in Rochester, N.Y. She participated in the "Maize Craze" contest described in the February/March issue of the *Review*. The goal of the competition was to stimulate student interest in math and science. Her team traveled to Washington, DC, to observe the presentation of the 1992 Science and Technology Medals by President Bush in a Rose Garden ceremony on June 23, 1992. . . . **Norman Burtness** quit Pratt and Whitney after more than five years of designing jet engines to become a physics and chemistry teacher because he wanted to spend time with kids, and he loves teaching. He also received a private pilot's license in May 1992. . . . **Edward Korczynski** is currently earning money doing product marketing for semiconductor production equipment. He is living in Santa Cruz, Calif., and maintains his sanity by playing music and practicing meditation. Ed's *Dewar's Profile* quote: "The only constant is change; enjoy the illusory dance."

**Jay Elson** is working at Los Alamos on safety analysis of nuclear reactor systems. He and his wife, Jean, have been married nearly five years, and they now have a 15-month-old son. Jay is a first-degree black belt and a martial arts instructor. He is looking forward to a summer of landscaping around his newly constructed home. Jay informs us that **John Ragan** has finished a postdoc in organic chemistry and is now working at Pfizer Pharmaceuticals. . . . **Dan Beyerbach** finished graduate

school at Boston University in 1991 with a degree in signal processing, and he still lives in Brookline. He is now planning to go to medical school and is currently taking pre-med courses at Harvard (hiss) Extension. After grad school, Dan took up golf with a passion, and he is quite a fanatic now. He has also been training for the Boston Marathon in his apparently copious spare time.

Next month I hope we will be hearing from **Thuan Tran**, **Pamela Mitchell Pleus**, and **Jan Roos**. . . . Please send news to Bill "I'm-back-in-the-saddle" Messner, secretary, 5927 Alder St., Pittsburgh, PA 15232, internet: bmessner@andrew.cmu.edu

## 86

Short column this month due to lack of news. Surely you guys are doing interesting things that you'd love to brag to the rest of us about. At a minimum, you're probably tired of hearing all about Erik and me. So send those letters in. NOTE the new address.

**John Martin** graduated from Stanford Business School in June 1992, moved to Atlanta, and started work at McKinsey & Co., as a management consultant in August. Thomas (his third child) was born in May 1992. At six months old, he's already 22 pounds! They enjoyed their first Christmas in their new home and are looking forward to the 1996 Olympics.

**Sara Woodhull** is still working for Oracle, along with many other MITers: **Daniel Sternbergh**, '87, **Bob Brodersen**, '87 (who just got married this summer), and **Al and Siu Chang**. Sara, along with **Craig Fuget**, '83, are still doing Gilbert and Sullivan backstage work as well as some ballroom dancing. . . . **John Bartholomew** and his wife, Kim, seem to have survived the first stages of parenting: their son Dylan is nearly one and a half. The remaining members of his band (Mr. Seed) had made a music video to be shown on Portland's cable access channel last November. John marveled at how many days of work went into just a few minutes of air time.

**Linda Robeck** bought a house last summer in beautiful Altadena. She's still working for JPL—got a promotion to section staff and is now in charge of the metric transition activity. That's right, how do they change over millions of dollars worth of tools and equipment to handle all metric sizes? . . . **Chris Medina** is still working as an electrical engineer with Shell Pipe Line Corp. (a subsidiary of Shell Oil Co.). He has been there almost three years, which by Shell's standards is time to move onto a new job/location. It looks like he and his wife, **Karla**, will move to the head office in Houston where Karla will try to get into a residency program in anesthesiology. They're looking forward to Houston and the opportunity to afford a large house at a reasonable price. After living in Los Angeles for the past few years, anything seems affordable. (I've got a good example of this: our mortgage payment on a 3,000 sq. ft. house is only \$50 more than our rent was in L.A.!)

Not much new on the home front. We went to North Carolina to buy furniture and ended up buying a leather couch (which we didn't need). Had a stupendous ski trip to Mammoth the last weekend in January—thigh-high powder and no lift lines. It was the best skiing I had ever had. We're also planning a St. Patty's Day party (more to come on this). See you next month, same time, same channel.—**Mary C. Engebret**, secretary, 21305 Arrowhead Court, Ashburn, VA 22011, (703) 729-6568

## 87

Your class secretary would like to use this column to publicly apologize for scheduling the MIT Club of Austin's first official event at what turned out to be "ground zero" of the city's worst hail storm in over a decade. Several members of our class, including **Wan Y. Lee** and **Emilio Lopez** were among the 40 or so who attended the happy hour event at Tangerine's in the Stouffer Arboretum. The 20-minute hailstorm, which hit at about 6:30 p.m., produced 2-inch diameter hailstones and caused over \$50 million in damage. (My 6-month-old Taurus was one of the casualties, to the tune of \$4,100. I'm hoping that some of the attendees were smarter than I and parked in the adjacent garage instead of outside.) I'm not exactly sure what Wan and Emilio are up to, nor am I certain of who else from our class attended, as I spent most of the evening at the pay phone trying to contact my insurance company to file a claim. I sincerely hope that all of our events are not this exciting!

I've actually been busy lately. In addition to working on my dissertation and teaching three math classes at Austin Community College, I spent part of spring break in Cincinnati visiting friends. I stayed with **Hoi Man Siu**, whom I also saw "in concert" on two consecutive evenings. **Hoi Man** sings first tenor in two different choral groups—one that presented a concert of Broadway showtunes and the second a program of German lieder. . . . **Rovena Sobarzo** drove in from Indianapolis and joined us for the first concert. She's spending lots of time getting settled in her new three-bedroom house, into which she moved in December. (Bet the builders were "thrilled" to have an MIT alum supervising their work!) Her most recent purchases for the house were a lawnmower and materials for the flower and vegetable gardens. **Rovena** just got back from Chile, where she spent three weeks touring and visiting relatives. She is very busy with her job, too; she works for **Eli Lilly and Co.** as a pharmaceutical products manager, coordinating the development of products from discovery to market launch. Finally, **Rovena** requests that classmates **Hal Cohen** and **Linda Marinelli** write in, so she (and all of us) can find out how they're doing.

On the same trip, I had dinner with **Neal Hoyer**, who works at Ethicon Endo-Surgery, where he does analysis on their surgical stapling instruments. Neal's recent travels have included New York City in December, where he met up with **Adam Kane** and toured various museums and ate "fine Italian food." January found Neal skiing with friends at Snowshow, W. Va., where he reports that "the snow was all unnatural and most of the skiers as well"—they even saw a MedEvac chopper take away one of the casualties. Neal also skied in Utah later in the month with some coworkers and at Breckenridge in February, where he met up with **Pat Kinney**, '82. Neal is spending the rest of his spare time renovating portions of the house that he just bought near Observatory Hill in Cincinnati.

From this month's mailbox: **Mark Foringer** has been reassigned from his current post (in Florida, I believe) to Wright-Patterson Air Force Base in Ohio. There he will start a master's program in mechanical engineering at the Air Force Institute of Technology. . . . **Gregg Hara** writes, "After having worked for GTE in the Engineering Associate Department for four years in San Jose, Raleigh/Durham, Tampa, and Dallas, I left to join a small software firm located in Sacramento, Calif. The firm,



Objective System Integrators (OSI), makes integrated network management software. I work in customer support, with duties ranging from pre- and post-sale support, installation, and training. I have been back in Boston on business, and got together with **Jim Brennan**, **Mike Nadolin**, and **Mike McDermott**, '91." ... **Eric N. Starkman**, who works as a manager with Andersen Consulting, has just relocated to their Cleveland office. For the past two years, Eric has worked in New Zealand as a project team leader for the Inland Revenue Department (IRD), assisting the IRD in collecting child support from non-custodial parents. ... **Al Cangahuala** married Maria Elisa Rey of Bogota, Columbia, August 8, 1992. The wedding, held in



**Eric Starkman**

Pittsburgh, was attended by many alumni/ae, including friends from his days at Chi Phi and at New House as Spanish House tutor. Those present from our class included **Dave Schultz**, **Bill Irving**, **Pat Aichenson**, and **Dave Kemper**.

Well guys, unless another natural disaster befalls Austin, I won't write about myself for a while. So, I'll need your help to fill the column next time. Also, if you've simply been mentioned in the column, write in, and let me know what you've been up to—your classmates want to know!—**Jack Leifer**, secretary, 2703 Swisher St. #202, Austin, TX 78705, (512) 472-7507, e-mail: leifer@ccwf.cc.utexas.edu

## 88

**John Kohl** completed a master's in computer science at UC/Berkeley in December 1992 and presented his work at the USENIX conference in January 1993 in San Diego. He moved back to the Boston area (Billerica, Mass.) and is working in Nashua, N.H., for Digital Corp. on the OSF/1 operating system. ... **Ken Raeburn** and **Mark Eichin** are working for Cygnus Support in the Kendall Square office.

**Peter Gasparini** writes with much news. He is engaged to Linda Dahl (DePaul, '90), and they have set their wedding for February 19, 1994. Honeymoon plans are being made for Hawaii. Peter met Linda when he moved to Chicago in 1992, and they plan to stay there with his dog, Zamboni. Peter still works for Takenaka International, a Japanese design/build company, as a project site manager. Peter attended the Beaver Cup VII in Pasadena, the annual MIT vs. Caltech ice hockey game that has MIT hockey alumni playing against Caltech's Varsity for "bragging rights to ice hockey prowess." The MIT Beavers won 4-0 on Valentine's Day with two goals by **Tom Dorf** and one goal each by **Dennis Clarke**, '84, and **Brian Fabes**, '83. MIT has never lost a Beaver Cup game—this year the record was increased to 7-0.

Peter also visited **Mark Carroll**, **Joe DiSabato**, and **Rob Cotter**, '87, while in California. They are all MBA students at UCLA. Peter currently lives in Chicago with **Lieven VanMarcke**, an MBA student at Kellogg. Friends can reach them at 831 Sherman Ave., Evanston, IL 60202.

**Pierre Chao** is currently the director of mergers and acquisitions at JSA International, a high

technology management consulting firm in Cambridge, Mass. ... **Tom Spitznagel** completed a PhD in chemical engineering at UC/Berkeley and has since moved back to the Boston area, working at Genetics Institute in Andover, Mass. ... **Joseph Rondinella** is a swaps trader for Sumitomo Bank Capital Markets in London. He's been in England for two years and in New York before that. In New York he could claim to have been the "highest paid" MIT graduate (offices on the 96th floor of the World Trade Center, before the explosion). Since he's been in London, he's had many MIT buddies drop by. Joe welcomes alumni/ae in London to give him a call.

**Aida Ayala** is working for Du Pont, outside Houston. She is engaged to **Fernando Garcia**, who also works for DuPont but in Mexico. ... **Sonia Estevez Alcolodo** recently married **Joel Holl**. Both work for Bell Labs in New Jersey. ... **Ellen Burnerko Plotkin** is finishing her degree in patent law in New York. ... **Marcos Esterman** is on temporary assignment in South Carolina with GE. ... **Captain Pedro G. Almeida** is serving the U.S. Army as commander, C Troop, 6-6 Cavalry, AH-64 Apache Attack Helicopter Troop in Ilsestein, Germany. ... **Arlene (Shames) Bernhardt** was married to husband, **Marc (RIT '86)**, in June 1992. Arlene received an MBA in the management of technology from Wharton in May 1992. She is now working at Credit Lyonnais in Manhattan.

I am finishing up my internship (writing this in April), and I must say it hasn't been as bad as I imagined except for about three weeks with "Dr. Sunshine," as I like to call my "favorite" cardiac surgery fellow. I'm sure some of you have similar experiences. ... perhaps you'd like to share? I've got vacation coming up this month. Ask me how ready I am for it! I plan to do some skiing in Utah, visit friends in Pasadena, visit grandparents in Taiwan, make a shopping side-trip to Hong Kong and stop for some R&R in Hawaii on the way back. A long-awaited break. Thanks to all who wrote. Hope you all have a great summer!—**Grace Ma**, secretary, 155 East 29th St., #32H, New York, NY 10016, (212) 447-1925

## 89

There is quite a bit of news this month; thanks to everyone who took the time to write and send e-mail. We still haven't gotten any picture submissions for the class calendar yet, so please send those pics in! There is also a new submission format, video tape (either VHS or 8 mm). All submissions will be returned.

Here is this month's list of people we'd like to hear from: **Mike Casagrande**, **Errol Grannum**, **Matt Machlis**, and **Randall Smith**. What are y'all up to? If anyone knows about any of these people or anyone else, please write!

Our class gift, a scholarship fund, has grown to the point that we were able to award two scholarships this year. Way back in '89, the scholarships were specially designated so that students active in community service would receive priority. Our two recipients are **Rajiv Gupta**, '93, and **John Chiu**, '92. **Rajiv** is double majoring in math and management and has been active in his fraternity, Pi Lambda Phi. He has served as pledge trainer, house manager, VP, and rush chairman, and (through PLP's community service projects), has participated in the Special Olympics, the Walk for Hunger, and the Red Cross.

**John** is studying biology and is planning a

medical career. To that end, John has done a great deal of volunteering at Children's Hospital. He particularly enjoys the direct interaction with the patients and currently spends up to four hours each week at the hospital. ... Thanks to everyone who has contributed to our class scholarship, and I hope you will continue to designate your gifts to our class gift.

In the volunteering theme of things, **Lori Tsuruda** founded a nonprofit community service organization, **People Making a Difference**. Typical service projects are hands-on, single day projects that involve cleaning, painting, and gardening for nonprofit organizations in the greater Boston area. PMD is funded by consulting fees resulting from assistance in service project advising, planning, and implementation for organizations who lack their own in-house staff. This past fall, Lori received the Riverside Community Mental Health and Retardation Center's first outstanding volunteer service award. Recently, Lori organized 50 people in an accessibility survey, related to the Americans with Disabilities Act. Volunteers visited retail stores, restaurants, and other businesses in Back Bay, and surveyed for levels of physical and communication accessibility. Survey results were placed into a database for use by persons with disabilities. In addition, this information served as helpful guides for businesses to identify and remove architectural and communication barriers to customers with disabilities. Anyone with a strong commitment to community service is invited to contact Lori about board and project participation. Her address, as are the addresses of any alumni/ae, is available through the Alumni/ae Records Office.

**Andrew Yee** writes about his quest to find the perfect snow on his bi-annual ski trip. This past President's Day weekend took Andy and many other classmates to Salt Lake City, Utah. Those present included **Michael Chung**, who is attending Ohio State Medical School, soon to be first-year resident; **Thomas Barraza**, who is working at Pitney Bowes in Connecticut; **Bernard Lee**, who is studying pre-med at Columbia U; **Daniel Ryu**, who is working for Cherokee Clothing in LA; **Phil Won**, who is at Ford Motor Co. in Dearborn, Mich; **David Wang**, working at William Mercer, in NY; **Andy Yoon**, '88, who is working for Oracle, and **Andrew**, who is in Northwestern U grad school. **Kevin Coleman**, who is working for Ford, tore his anterior cruciate ligament 10 days before the trip and was unable to attend. Andrew reports that they had some of the best skiing conditions that Utah has had in years. They are looking forward to Ski Trip 1995 already. "We hear the snow in the Chilean mountains is excellent, we'll be sure to pack plenty of food for that one," Andrew concludes.

**Kurt Roth** (Phi Delt) writes that **Jeff Alexander** (Phi Delt) married **Jocelyn Balin** (Wellesley, '89) last July 5. Jeff received a master's in CS from Northeastern and has returned to Draper Labs and is enjoying work there. Jocelyn teaches in Fitchburg, so they decided to compromise and live in Boxboro, Mass. Jeff is playing a lot of hoops. **Gordon Long** ('87, Phi Delt) and **Kurt** were in the wedding party, as were **Mark Anderson** and **Lori Aronson**. Mark is working on a poly-sci PhD at Harvard, and Lori is finishing out an MD from Case Western at a local institution. Mark and Lori currently live in Belmont. ... **Ron Dagostino** (Phi Delt) was married to **Cheryl Mandelick** last February. They both work for Fidelity Investments now, "just what everyone expected from Ron (a longtime capitalist fun-



damentalist)," Kurt reports. . . . As for Kurt, he is in his fourth year of ME grad school here at the 'Tute, having completed his doctoral exams last May. He has declared music as his minor field of study and is playing cello in two string quartets this past term.

Scott Tennant (Phi Delt) drove all the way from Tennessee (Arnold Air Force Base?) to attend a party held by Becky Yap (Wellesley '87). Scott supervises an Air Force wind tunnel. This is the final year of Scott's commitment, but he is still unsure whether he will re-up, attend grad school, or hunt for job. Many other Phi Delt members were there, including Woody Chin, '85, Scott Baird, '87, Frank Modica, '88, Darius Sankey, '88, Rick Kim, Ron Dagostino, and Russ Steven, '91.

California newcomer Teri Centner made her way to Berkeley, San Francisco, and the Sierra Mountains—all in two days! Teri recounts her tale: "Randy Mackaman (Air Force friend) called from Ohio to tell me he was going to be in San Francisco the last weekend in February. Since that's only 90 miles from my new home, we decided to get together and go skiing—a sport I had never attempted. I called Dan Garcia to see if he would be willing to go. He jumped at the chance, but warned me that I had to provide all transportation since he is a poor, car-less grad student. No problem—I have my trusty four-door Mazda 626!"

"The place we skied is called Boreal. First I had to learn how to walk with the darn skis on, and then I had to learn how to stand in a lift line without running into people or standing on their skis. I also found that not everybody out there has skied before, so if you run into somebody as inexperienced as you are, everybody falls down, and it makes a big mess."

"The instructor took us up to the top of the mountain on the quad lift. At the top, he pointed out the 'easiest' way down and basically said 'Go for it.' So off we went—as slow as we could. At first it wasn't too bad. It looped around so it wasn't that steep. But it got worse. And it was not comforting knowing that if you messed up and turned too late, you would go off the edge of the mountain. At the really steep parts of the run, when I started going so fast I felt I was losing control, I decided to ski on my backside and a little on my elbows. After I finally made it to the bottom, I was very sore. My thighs hurt, my head hurt, my thumbs hurt. So I quit for the day. I think three hours was quite enough for a first attempt. . . . So, that was my first California adventure. I have conquered one of my greatest fears (driving in San Francisco with a manual transmission) and I have learned to ski—sort of."

Sam Peretz finished a second SB (in EE) in February and now is working as a software developer for Monitor Co., a Cambridge-based management consulting firm. Sam is living in South Boston near UMass/Boston. . . . Richard Carreiro was recently engaged to Jenifer Tidwell, '91, and will be married in late spring 1994. . . . Krisztina Holly had an amazing ski trip to Alta, Utah, during March. "It was hard to get back to work after that one! (It's also hard to enjoy New England skiing after that, too.)," Krisztina reports. Krisztina has some sad news to relay, that Merlin, her 8-foot Burmese python died last summer. On the happy side, things at Stylus Innovation are going very well. "We have just hired another software developer, which makes five employees now. Stylus was formed

a couple of years ago by three MIT alums; Michael Cassidy and John Barrus are the other two partners. Our main focus is still the bar code/voice response order entry system that won the \$10K Entrepreneurial Competition in 1991, though we are targeting the business-to-business market (rather than the consumer market) first. We have licensed the bar code wand manufacturing and sales to another company, while we have been focusing more on the interactive voice response software end. There is no end to the things that have to get done, but it makes life exciting."

Dan Garcia was just awarded a three-year National Science Foundation Fellowship, effective in August. Dan is planning to graduate in 1996, and will be funded for the remainder of his graduate career. Dan also received an "Outstanding Graduate Student Instructor" award.

Joe Lichy and Elizabeth Greyber were married on Sunday, April 4, at Congregation Har Shalom in Potomac, Maryland. Phil Kuhn was the best man, Erica Wickstrom '90 (who is in grad school at Stanford) was the maid of honor, and Laura Scolnick '90 (who is attending grad school at UPenn studying chemistry) and Robin Zehr were bridesmaids. Among those in attendance were Greg Sherwood, Lori Preece '88, Tom Farkas, Steve Payne, who is working for Credence in Oregon, Alice Mendelsohn, who is attending grad school at Northwestern. Bill Maney, Angeli Salgado, Sam Druker, Lindsay Haugland, who is finishing graduate school at MIT with two master's degrees and looking for a job, Pete Colao, and Ron Koo, who is working for Maxim Integrated Products in Silicon Valley. Joe, who is working for Intel in Santa Clara, and Eliza-

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Marc Jorrens '89

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## GAZETTE

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beth, who will be getting her MD from Stanford in June and starting her residency in urology at Stanford, will take a two-week honeymoon in Europe.

Many of the attendees are engaged to be married, too: Greg Sherwood, who is working for Engineering Resources Associates in Virginia but plans to attend grad school in the fall, and Lori Preece, who is working for the American Trucking Association. Tom Farkas is engaged to Julie; Robin Zehr, working for a spin-off of ICI in Mobile, Alabama, is also engaged.

Ron, who relayed most of the information from the wedding, stayed with Dean Ebesu in Rockville, Maryland. Dean is working at the Fusion Lighting division of Fusion Systems. In his spare time, he volunteers as pit master at amateur car races.

Angeli Salgado reports that she and Bill Maney are quite involved with their wedding plans. They are getting married August 28 in Monterey, Calif., and both their families are looking forward to a vacation from their homes in New York. Angeli and Bill are still rock climbing, and went to the Pinnacles National Monument in early March. They also climb indoors, where they sometimes run into Greg Schaffer, '61, who is Bill's boss at Maxim Integrated Products. Angeli is working at Professional Retirement Services, a small third-party pension plan administration firm in Burlingame, Calif. As of now (tax season), Angeli has been very busy, both with work and a class that she is taking for work. Angeli ran into Grace Tseng, '90, and Dean Chang at Cafe Montmartre in Palo Alto. Dean will probably finish at Stanford in a few years, and is having a whole lot of fun. . . . Anthony Lombardo, who lives in Birmingham, Ala., is working on a PhD in neuroscience, studying the molecular mechanisms of epilepsy. Last October, Anthony visited Robert Maldonado, '90, in San Diego. "The surf at La Jolla beats the heck out of that in Birmingham," Anthony states. . . . Jackson Bross is currently teaching at Hold Child High School in Potomac, Md. Jackson is teaching math and is also participating in the school musical.

Susan Streisand just started working at AT&T Bell Laboratories in Holmdel, N.J. She is working on intelligent vehicle highway systems. . . . Jeff Hornstein recently attended classmate and fellow Zeta Psi pledge brother Frank Oh's formal engagement ceremony in southern California. Also there was Zeta brother Steve Towle, who is progressing rapidly toward a materials science PhD at Stanford. Jeff had PhD qualifiers this past April in comparative politics. After completing them, he will be off to Russia for the summer. . . . Elizabeth (Clapp) Goodrich was married to Paul Goodrich last September on Cape Cod. Elizabeth and Paul work at Genentech in South San Francisco. In attendance at their wedding was Livia Raczy, John Mandeville, Anjali Arora, Beth Pemberton, Jeff Polevoy, Steve Beringhouse, '87, and Ryan Fong, '87. Elizabeth and Paul honeymooned in Hawaii during Hurricane Iniki, but luckily Kauai was the last island on their agenda and they were able to skip it instead of wind-up stuck on it.

Julie Shreeve is working on a PhD in inorganic chemistry at UC/Irvine. This October, Julie will be getting married to Roy Keyer, who is a postdoctoral fellow at Naval Research Labs in Washington, D.C. Julie recently saw her old roommate Julia Putnam, who is doing very well and was married this past spring. . . . Mike Monegan is working on software development tools at NeXT. In his free time, Mike races sports cars and rides his mountain bike up in the Santa Clara moun-

tains. . . . Sandra Skov is working as an investment analyst for CVS, the drugstore chain, at their home office in Woonsocket, R.I.

Well, that's it for this month. Next month we'll have some news about the upcoming 5th (five years already?) Reunion.—Henry Houh, secretary, 4 Ames St., Cambridge, MA 02142, (617) 225-6680, e-mail: tripleh@athena.mit.edu or henry\_houh@mit.edu

## 90

Eric Nudelman is back in the United States after spending a year in Trinidad, working for Schlumberger. On February 23, 1993, Eric married Tricia Henrich of Simmons College, in Worcester, Mass. Now Eric is working in Washington, D.C., for MIL3, an MIT start-up company. . . . Mark Edelson recently finished eight months of construction work in Korea for the Navy. He's now the officer in charge of a seabee unit in San Diego. . . . Peter Gordon writes that he is now a patent agent, which means he is registered to practice before the U.S. Patent and Trademark Office. He is employed at Wolf, Greenfield, and Sacks in Boston.

Ravi Chiruvolu has been working for McKinsey & Co. in Washington, D.C., ever since he got a master's in mechanical engineering from MIT in 1991. However, in September, Ravi will be returning to Boston to attend the Harvard Business School. . . . Curtis Barnes has recently reported for duty with Headquarters and Support Battalion, Marine Corps Base at Camp Pendleton, Calif. . . . Joe Babiec is working at Monitor Co. in Cambridge. . . . Alex Caro is studying for a PhD in computer science with a minor in finance at MIT. . . . Supreco Ghosh is finishing up his first year at the MIT Sloan School of Management.

It's been three years since graduation and I'm still hoping to hear from everyone in our class. Please write in and let your classmates know what you've been up to. Send news to: Ning Peng, secretary, 305 Memorial Dr., Cambridge, MA 02139; or email: ning@athena.mit.edu.

## 91

After graduating from MIT with a master's in mechanical engineering a year ago, Kristin Slanina spent six weeks living in a tent and backpacking in Europe with Steven Schondorf, '88. When the two finished touring England and Ireland, Steven proposed to Kristin in Paris. They will marry on July 13. Kristin now lives in Dearborn, Mich., and works at Ford's Engine Division.

Alex Min has finished primary training with the Navy. He reports that during his training he "pulled 5 G's doing a maneuver called a 'Cuban Eight.' That's a rush." Alex sends news about several classmates: Dave Haldemann, according to Alex, has discovered that "apparently navigators really don't have much to do on air-crew." . . . Steve Tucker and Jeff Myjack saw Alex after winter training with the MIT crew team. Alex says that Steve and Jeff are "traveling cross-country to points west while continuing their training for the U.S. National Lightweight crew team."

Derek Rutherford married Michelle Lydeen (Brandeis, '90), on May Day in Mandan, N.D. Derek lives in Hinesville, Ga., where he is stationed at Fort Stewart as a platoon leader, 11th Engineer Battalion, 24th Infantry Division. . . . Partho Ghosh lives in Watertown, Mass., is



consulting at Lotus Development, and is a partner in Equus Holdings, a money management partnership.

Scott Davie sends a postcard picturing a summer view of Minneapolis' Lake Calhoun, but notes that in February, "it's five below zero! Supposed to be fifteen below tomorrow!" Scott finished a master's in mechanical engineering at Stanford last June and is now working at Medtronic in Minneapolis. "I'm trying to get used to life in the Midwest," says Scott. "I saw Joe Gomes in Los Angeles over Thanksgiving: he's just starting with Ford in Michigan, having completed a master's in December. Maria Yang is back at Stanford and is getting into lab research. Lon Van Geloven is keeping busy there as well, TA'ing and doing battle in the electronics lab." Scott went skiing with Imad Mazine and Juanjo Alonso, who is doing his qualifiers for a PhD program in computational fluid dynamics at Princeton.

Minor S. Huffman III, '88, surprised Sabrina D. Tellalian with a romantic weekend last September by flying her to Bermuda, where he proposed to her among the moon and stars. The couple plan a summer wedding. Minor is a project leader in commodities trading at Lehman Brothers, and Sabrina is a financial analyst at Merrill Lynch. . . . William Bankhead is still pursuing a PhD in political science at Berkeley. Last summer he was involved in an internship looking at transportation issues. His roommate, Mark Dunzo, has finished a master's in transportation engineering and is working on a second master's in city and regional planning. William also sees Mark Walker, who is also studying for a political science PhD at Berkeley. When William and I spoke in March, he said, "Mark is studying, well, Soviet—or whatever you can call it now—politics." I can only wonder what we will be calling it when you read this in July.

Trish (Wellesley, '91) and Jason Sherman were married last August in North Andover, Mass. Jason changed jobs in December and is now a project engineer for Alerton Technologies, doing facilities and process control systems for Boeing. Trish works for Dykeman Architects in Everett, Wash. "We have a pet rabbit (well trained) who roams the house," writes Jason. "His name is Buggy, of course!" . . . Paul Borghesani sends a postcard of the Colosseum in Rome. Paul, who is in the Harvard/MIT HST program, was in Zurich, Switzerland, for an Alzheimer's research meeting and he decided to tour Italy for a little vacation.

Adelina Yen spent a year and a half in Dallas before moving back to the D.C. area. She now works for EDS as a research engineer. Over Christmas, Adelina met up with Leslie Fan and Ellen Shen. Leslie attends Columbia medical school, and Ellen is in Hartford, Conn., working for the Travelers. Adelina also saw Lee Heavner, who shares an apartment with Luis Espinoza in the Los Angeles area, where both "seem to enjoy living right by the beach."

Roger Chen was in Boston on vacation during March when he, Paul Antico, and I had lunch together. Roger works with Chris Neil, '89, at Maxim in Silicon Valley. Roger has been skiing at Lake Tahoe with Adam Schwartz, Matt McCluskey, Sandra Ma, and Adam Brand, '90. Adam Schwartz had worked at an options exchange company, but is now at the University of Illinois at Urbana-Champaign working on a PhD in physics. Matt is studying physics at Berkeley. Sandra works for Loral in San Jose, and Adam Brand works at Intel. Roger also sees Marcelo

Torres, who is studying operations research at Stanford; Dave Auerbach, who studies chemical engineering at Berkeley; and Ed Munnich, who is teaching.

As for myself, I will spend my third year at Boston University Law as the editor-in-chief of the *Annual Review of Banking Law*. The job is actually a lot like being class secretary: I'm always asking people to write, face a lot of deadlines, and receive a few free bagels every once in a while as compensation. And since I am getting pretty used to asking people to write, I'll ask you to send some news, too!

Send those postcards! Please write to—  
Andrew Strehle, secretary, 12 Commonwealth Court #10, Brighton, MA 02135, (617) 232-2261

## 92

Congratulations are in order this month for a bunch of our classmates. I have received word that Danny Rubinstein was married to his high school sweetheart Lida Rodriguez in a civil ceremony during Christmas break. There was a major ceremony just this past June on Long Island. . . . Marylinton Thompson and Stephen Peters, '91, have been married almost a year now. They are living in Fremont, Calif. Melanie Lazaro and Trinidad Flores, '91, are to be married this month.

Chrissy Kwon writes with lots of news. First, she corrects me that she is attending SUNY/Brooklyn HSC, not NY Medical College. . . . Cindy Evanko is in Pittsburgh where she is working towards a PhD in environmental engineering at Carnegie Mellon. . . . Debbie Min is working in Manhattan for Delloite & Touche. . . . Jonah Benton is working in Connecticut for The Traveler's Insurance Co. . . . Brian Hines is a first-year medical student at Boston University. . . . Lisa Arel is attending UC/San Francisco Medical School where this past year she shared the same stress and sleep-deprived existence as all other first-year medical students (according to Chrissy).

Sonny Ahn is working and wondering if he'll ever adjust to putting on a suit everyday. . . . Lisa Primiano is attending graduate school for genetic counseling at Virginia Commonwealth University. She is one of only four students accepted each year. . . . Sonia Chung is working in a research lab at Johns Hopkins University while applying to medical school for this coming year. . . . The happy travellers Chrissy writes about include Whitney Postman, who spent the last few months in Austria, and Christine Ma, who has been playing in Australia—hiking and scuba diving. Thanks for all the updates, Chrissy!

Many of our friends have by now completed their first year of graduate school. Stacy Hollander and Helen Shaughnessy are sharing an apartment in San Francisco while they attend Stanford University. Helen is getting a master's in mechanical engineering, and Stacy is working on a PhD in materials science. They are excited to be in sunny California but say they miss everyone at MIT. . . . Andy Liu and Conrad Yoder are also in graduate school at Stanford. . . . Todd Rowland is at University of Chicago with a goal of securing a PhD in mathematics. . . . Jennifer Alpert is at Boston University graduate school for history.

Felicia Washington is in the PhD program at Rice University in Houston, Tex. Her research concerns hand prostheses. . . . Theresa Derderian is attending UPenn graduate school for materials science and engineering.

. . . Jane Yu is a medical student at Johns Hopkins University. . . . Eric Zylstrom and Stacy Au are both attending UC/Berkeley graduate school. Eric is studying organic chemistry. . . . Kelly Davis received a graduate research grant to work towards a PhD in theoretical elementary particle physics at Rutgers University in New Jersey. . . . Austin Sloat is in graduate school for Architecture at the University of Hawaii.

Others have chosen to stay right at MIT for graduate school: Michael Clarke and Suzanne Garber are pursuing master's degrees in aeronautical engineering, and Nicole Love is working on a master's in electrical engineering.

This past year, a program was started that sent 120 MIT volunteers into Cambridge schools. *The Tech* reported on this program but neglected to mention that our classmate, Mark Duggan, was the force behind the tremendous effort required to put this program into play. Good luck and keep up the good work. . . . Lynn Niles writes that she is working at Ebasco Services for their environmental consulting division located in Lyndhurst, N.J. Lynn is not the only one to choose the "real world" route after college. . . . Katy Broughton is working at Livermore Labs in California. . . . Josephine Lai is working at Bristol-Myers Squibb Co. in Princeton, N.J., as a researcher.

Freeland Abbott is working for Cambridge Technology Group along with several other '92 alums. They are working on spinning out a new company, OpenSoft. After a few years, Free-land says he, too, may go back to school for a master's degree. . . . Chris Foley is consulting in the Boston area while trying to get a couple of patents. He is also in a band called Skunk in the House. . . . Erica Song remained in the Boston area as well. She is taking classes to fulfill pre-med requirements and hoping to start medical school this coming fall. . . . Jeff Kuehn, who was working as a personal trainer in New York, decided to escape the intensity of summer in the city and join me out here in Aspen. I can't tell you how great it is to have an MIT buddy here to share the mountains with.

That's all for now. Thanks again to everyone for sending news. Please keep it up. There's still plenty of you we haven't heard from. Write to me in New York still. It's the surest way I'll get your mail.—Leslie Barnett, secretary, 56 Brown St., Mineola, NY 11501

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## I CIVIL AND ENVIRONMENTAL ENGINEERING

**John P. Dugan, Jr.**, SM '68, writes: "In addition to managing the Haley & Aldrich, Inc., office in Glastonbury, Conn. I am president of the Connecticut QBS Council, Inc., which promotes



**Olivia Reyes West**

qualifications-based selection of design professionals." ... **Olivia (Libby) Reyes West**, SM '88, PhD '91, a research associate in the Environmental Sciences Division at the Department of Energy's Oak Ridge National Laboratory (ORNL), has been awarded the 1993 Rocha Medal by the International Society for Rock Mechanics (ISRM). The medal is awarded annually by the ISRM to honor the memory of past president Manuel Rocha. West's PhD thesis, "Experimental Study and Analytical Modeling of Compressive Fracture in Brittle Materials," was selected for recognition from nominations around the world. Before joining ORNL in 1991, West was a research assistant at MIT from 1985-90. Currently, she is researching groundwater modeling and remediation of contaminated soils. In 1991 she was the recipient of the Wigner Postdoctoral Fellowship. West is a member of the Association of Civil Engineers and the National Water Well Association.

**Lieutenant General Marshall Sylvester Carter**, SM '36, (U.S. Army, retired), of Colorado Springs, Colo., died on February 18, 1993. After a long career as an Army officer, Carter was named deputy director of the CIA by President Kennedy in 1962. In 1965, President Johnson named him director of the National Security Agency, a job he held until his retirement in 1969. Following WWII, he served in China as deputy and assistant chief of staff before becoming executive assistant secretary of war in Washington. During the Korean War, Carter served as director of the executive office of the secretary of defense. He later became deputy commanding general of the Army in Alaska and served as commanding general of the Fifth Region Army Anti-Aircraft

Command in Fort Sheridan, Ill. He was also the first chief of staff of the North American Air Defense Command. During his long military career, he received the Distinguished Service Medal, The Legion of Merit award, the Bronze Star, the Special Order of Yun Hui, the Order of the Orange Nassau, and the Order of Service Merit. After retiring from the armed services, he served as president of the George C. Marshall Research Foundation in Lexington, Va., until his retirement in 1985. ... The Alumni/ae Association has been notified that Major General **William L. Starnes**, SM '47, of San Antonio, Tex., died on February 3, 1993. No further information was provided.

## II MECHANICAL ENGINEERING

Commander **Peter C. Filkins**, SM '91, NE '91 (XIII), USN, sends word from Bremerton, Wash.: "Since graduation, I have attended engineering duty officer school, graduating first in my class. I am now working at Puget Sound Naval Shipyard as the carrier type desk officer, after working as a ship superintendent and project manager for the USS *Nimitz*." ... **Ellis W. Merschoff**, SM '80, writes: "I was recently promoted to the U.S. Nuclear Regulatory Commission's director of Reactor Projects in the Southeastern United States. Additionally, I was the only American on a United Nations lead assessment of the Balakovo Nuclear Station in Central Russia." ... **Timothy Berg**, SM '89, earned a PhD at Oxford University and has begun a Fulbright award to Lund University in Sweden.

**Brent Williams**, SM '91, sends word: "Kate (Laffey) Martin, '85, SM '87, and I work for Xerox Corp. in Rochester, N.Y. We participated in the 'Maize Craze' contest that was described in the February/March 1993 issue of *Technology Review*. The goal of that competition was to stimulate student interest in math and science by letting 9th- and 10th-graders work with engineers to build a small, tethered vehicle capable of picking tennis balls up off a playing field covered with dry corn. As the winner of the Chairman's Award, given to the team which demonstrated the best partnership between its students and engineers, the Xerox/Wilson High School team was invited to attend the presentation of the 1992 National Science and Technology Medals by then-President Bush. All 40 members of the group traveled to Washington, D.C., for a three-day sight-

seeing trip, the highlight of which was the Rose Garden awards ceremony on June 23." ... **M. Beth Shaw**, '89, SM '90, has been awarded a Robert Bosch Foundation Fellowship for 1993-94. The nine-month program includes high-level, full-time work experience in the public and private sectors in Germany. The program is very selective and open to only 15 American citizens each year. ... **Eugene C. Gwaltney, Jr.**, '41, retired as chair of the Russell Corp. in Alexander City, Ala., this past April. ... **James H. Williams, Jr.**, '67, SM '68, the School of Engineering Professor of Teaching Excellence, was presented with Boston Edison's Seventh Annual Outstanding Professional Achievement Award last February. Williams is known for his commitment to minority student development.

The Alumni/ae Association has been notified that **Harold E. Williamson**, SM '49, of Truckee, Calif., died on February 12, 1993. No further information was provided.

## III MATERIALS SCIENCE AND ENGINEERING

**Christopher J. Kearney**, SM '83, sends word from Arlington, Mass.: "I am going to El Salvador this year to set up photo-voltaic-powered



**Charles Willingham**

lighting in a remote school." ... **Charles B. Willingham**, ScD '66, has been named a consulting scientist at Raytheon Co., the company's highest scientific level. Willingham has taught at Northeastern in addition to working at Raytheon corporate headquarters in Lexington, Mass. He is the co-inventor of the colorless form of zinc sulfide and for the past five years has been serving as principal scientist and program manager for Raytheon's diamond growth and growth characterization programs. ... **Peter G. Schunemann**, '84, SM '87, has been named a winner of Lockheed Sanders' Technical Achievement Award. The crystal physicist was recognized for his work in producing new crystal to be used in infrared laser systems. ... Navy Lieutenant **Zan E. Miller**, SM

### DEGREE CODES

AE Aeronautical Engineer  
BE Building Engineer  
CE Civil Engineer  
CHE Chemical Engineer  
CSE Computer Science Engineer  
DPH Doctor of Public Health  
EAA Aeronautical & Astronautical Engineer  
EE Electrical Engineer  
EGD Doctor of Engineering

ENE Environmental Engineer  
MAA Master in Architecture Advanced Studies  
MAE Materials Engineer  
MAR Master in Architecture  
MCP Master in City Planning  
ME Mechanical Engineer  
MET Meteorologist  
MIE Mineral Engineer  
MME Marine Mechanical Engineer  
MNG Master in Engineering

MPH Master in Public Health  
MTE Metallurgical Engineer  
NA Naval Architect  
NE Naval Engineer  
NUE Nuclear Engineer  
OCE Ocean Engineer  
PhD Doctor in Philosophy  
ScD Doctor of Science  
SE Sanitary Engineer  
SM Master of Science



'92, OCE '92 (XIII), recently graduated from the Engineering Duty Officer Course at the Engineering Duty Officer School in Mare Island, Vallejo, Calif.

**Wasudeo S. Rajadhyaksha**, SM '46, of Bombay, India, died on August 10, 1989, after a brief illness. Rajadhyaksha retired in 1987 as the technical and manufacturing adviser at Vikrant Tyres, Ltd., in Mysore, a company with sales in excess of \$200 million (U.S.).

## IV ARCHITECTURE

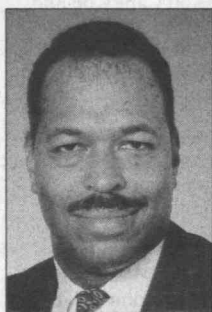


**Belinda Walters**

**Belinda Walters**, SM '86, has been named VP of Forest City Development, developer of University Park at MIT, a 2.3-million-square-foot high-tech and biotech park. As VP, Walters will be responsible for developing and implementing financing strategies for University Park, securing financing for individual building projects, creating the annual

strategic plan and budget, and administering Forest City's development agreement with MIT. Walters joined Forest City in 1987 as project manager.

From Seoul, Korea, **Woosung Kim**, MAA '72, writes: "I was awarded the second prize in the competition of the New Seoul Metropolitan Airport Design with combined efforts with the 'Airport de Paris.' The contract to design the supporting facilities of the NSMA accommodating 100 million passengers at the year 2020 to be signed." ... **Melvin F. Levine**, MCP '56, reports: "As a consultant to *The Enterprise Foundation*, I prepared a plan to bring downtown Homestead, Fla., back after Hurricane Andrew as 'The Pioneer Quarter,' a high-quality entertainment district. I have been working, as well, on an 'International Enterprise District' for downtown Holyoke, Mass., and a city-wide marketing strategy for Norwich, Conn." ...



**Daryl J. Carter**

**Daryl J. Carter**, SM '81 (XV), MAR '81, and an associate have created a limited partnership with the 200-year-old, U.K.-based real estate investment firm of Chesterton International, Inc. The firm will be known as Carter Primo Chesterton, L.P. (CPC). An investment advisory firm, CPC will specialize in mortgage debt invest-

ments in commercial and residential real estate on behalf of institutional investors, such as public and private pension funds and endowments. The firm will maintain offices in Chicago, New York, and Southern California. Carter, who is CEO and head of the Southern California office, also directs all investment management activities of the firm. Prior to forming CPC, he was president of his own real estate consulting firm, and previously he was regional VP of Westinghouse Credit Corp.

**Thomas H. Hodne, Jr.**, MAR '56, was one of 12 honored for design excellence at the 58th

annual American Institute of Architects (AIA) Minnesota Honor Program. Hodne was honored as the architect of the Fond Du Lac Community College, which opened last October. The Thunderbird-shaped building can accommodate 500 full-time students. It includes science and computer labs, administrative offices, an Ojibwe library and archive, and an amphitheater that also serves as a student commons. This building is the first in a series of three buildings the college plans to build on its new campus.

**Thomas Marshall**, MAR '52, is managing principal at James Pratt Architecture/Urban Design, Inc. in Dallas. The company recently received a citation for urban design in the 40th Annual P/A Awards Program sponsored by *Progressive Architecture* magazine. The firm won the award for their book *Dallas Visions for Community*, a planning document that identifies future design opportunities for the eighth largest city in the United States. According to a company news release, "The planning addresses four aspects of urban design in the city: Nature (exploiting the city's undervalued river and stream beds), Links (new visual systems to connect parts of the city), Neighborhoods (new 'villages in the city' and new public spaces for existing neighborhoods), and Downtown (new movement systems and public spaces)."

## V CHEMISTRY

**Sandra Russo-Rodriguez**, PhD '83, writes: "I live in Superior, Colo., with my husband, Andrés, and my son, Carlos Andrés, a few miles south of Boulder, where I work as a research scientist for the Amgen Corp. I am an active member of the local MIT Alumni/ae Club." ... **John E. Sheats**, PhD '66, reports: "I am a professor of chemistry at Rider College in Lawrenceville, N.J. I am also director of Project



**Philip Rakita**

SEED and Partners in Science programs at Rider." ... **Philip E. Rakita**, PhD '70, has been appointed director of Akishima Chemical Industries, a wholly owned subsidiary of ELF Atochem Japan. He was formerly department head for industrial specialties at CeCA S.A. in Paris. In his new assignment, Rakita will be responsible for the transfer of technology within the plastics additives business of ELF Atochem. He will also manage new commercial development at Akishima. Rakita's previous positions within the ELF group have included business management and commercial development positions in the United States and Europe. In 1976 he served as Senior Fulbright Professor of Chemistry at Moscow State University.

## VI ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

**James M. Moran, Jr.**, SM '65, PhD '68, writes: "I am currently professor of astronomy at Harvard University and senior astronomer at the Smithsonian Astrophysical Observatory. I spent six months in Germany doing research in radio astronomy as a Humboldt Fellow." ... **Edwin Z. Gabriel**, '51, reports: "I received a

U.S. patent last April on Automatically Actuated, Automatically Adjustable Cargo & Personnel Scooping and Releasing Apparatus. Helicopter manufacturers may be interested." ... From Palo Alto, Calif., **Robert Spinrad**, PhD '63, writes to tell us that last February he was elected to the National Academy of Engineering. ... **Paul D. Smith**, SM '61, has been named president and CEO of NBS Card Technology Corp. in Paramus, N.J. Previously, Smith was senior VP at Summagraphics Corp. in Fairfield, Conn. ... **Jonathan Abrokwhah**, '74, SM '76, a member of Motorola's technical staff at the Phoenix Corporate Research Laboratory in Tempe, Ariz., has been recognized for outstanding technical achievement at the seventh annual Black Engineer of the Year Awards Conference. The award cites his contributions to the semiconductor industry, including six patents and the invention of new classes of semiconductor devices. More than 300 nominees from throughout the nation were considered for 13 award categories. Selection and sponsorship is by the Council of Engineering Deans of the Historically Black Colleges and Universities, Mobil Corp., and *U.S. Black Engineer* magazine. ... **David A. Garbin**, '67, SM '73, EE '73, is one of three authors of *The McGraw-Hill Telecommunications Factbook: A Readable Guide to Planning and Acquiring Products and Services*. The book jacket promises jargon-free information on the latest technologies and business applications.

**Sumner C. Rosenberg**, '69, SM '71, EE '73, was coauthor of an article on "Clean-Room Methods of Reverse Engineering," which appeared in the *Fulton County Daily Report* in Atlanta, Ga. Rosenberg is managing partner at Needle & Rosenberg where he practices patent, trademark, and copyright law. Prior to this position he served as staff engineer at Draper Lab from 1969-74, and was then an associate at Troutman, Sanders, Lockerman & Ashmore.



**Marilyn Matz**

**Marilyn Matz**, SM '80, has been promoted to VP for software engineering at the Cognex Corp. in Needham, Mass. Matz will oversee the company's software engineering, documentation, and quality assurance functions. Matz was one of the founders of the company in 1981, beginning as a software engineer and playing an instrumental role in developing many of Cognex's core technologies. The company is known for its Optical Character Recognition and pattern recognition. She has held several positions over the past 11 years, most recently serving as director of software engineering. Cognex machine vision systems are used to replace human vision in manufacturing processes. ... **Kenneth H. Olsen**, '50, SM '52, founder of Digital Equipment Corp., was named the first "Entrepreneur of the Century" by the MIT Enterprise Forum. (See *Technology Review*, April 1993, page MIT 3.)

## VI-A INTERNSHIP PROGRAM

I sadly report the death, on the day before last Christmas, of Nilo A. Lingren, '48, co-author with Karl L. Wildes, SM '22 (XVIII), of the book *A Century of Electrical Engineering & Computer Science at MIT, 1882-1982*. The



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W.S. Zoino, '54  
J.D. Guertin, Jr., SM '67  
R.M. Simon, PhD '72

M.J. Barvenik, SM '76  
M.D. Bucknam, SM '81  
R.F. Cahaly, '60  
N.A. Campagna, SM '67  
F.W. Clark, SM '79  
S.E. Gately, SM '85  
W.E. Hodge, '77  
W.E. Jaworski, ScD '73  
C.A. Lindberg, '78  
J.D. Okun, '75  
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A.J. Ricciardelli, '78  
M. Walbaum, SM '88

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George W. Neuner, SM '66  
Gregory D. Williams  
Ernest V. Linek  
Linda M. Buckley  
Ronald I. Eisenstein  
Henry D. Pahl, Jr.  
David S. Resnick  
Peter F. Corless

book was published by MIT Press to celebrate the Department's 100th anniversary. I had the pleasure of knowing Nilo from his visits to Professor Wildes in our VI-A Office while they worked on the book. I had the honor of writing part of Chapter 7 covering my 18-year tenure as VI-A director. Nilo was enrolled in VI-A as an undergraduate. Following work on the book, he led seminars for the Electric Power Research Institute and later became an independent consultant. His home was in Santa Cruz, Calif.

On March 16 and 17, the Department hosted the biennial meeting of the Corporation Visiting Committee for Electrical Engineering and Computer Science. It is always a pleasure to note those committee members who are VI-A alumni—6 of the present 18 to be exact. **Joseph F. Keithley**, '37, SM '38, chair of Keithley Instruments, Inc., in Cleveland, Ohio; **John G. Linvill**, '43, '45 (XV), professor emeritus at Stanford University—a former associate in the VI-A office and past director of Stanford's Center for Integrated Systems; **H. DuBose Montgomery, Jr.**, '71, '72 (XV), SM '72, managing general partner at Menlo Ventures in Menlo Park, Calif.; **Raymond S. Stata**, '58, SM '58, cofounder, CEO, and chair, of Analog Devices, Inc., in Norwood, Mass.; **William R. Thurston**, '43, SM '48, past chair of GenRad in Harvard, Mass.; and **Andrew J. Viterbi**, '57, SM '57, CTO of Qualcomm, Inc., in San Diego. Stata chairs the Visiting Committee.

Earlier in March the Department hosted our company representatives for the annual VI-A business meeting, company open house, and two days of student interviews. The companies made available 93 openings this year (versus 81 in '92) and the VI-A office received 135 applications for these positions. As I write this, during spring break week, the student applicants are considering their rank ordered company offerings. Their preferences will be finalized upon their return.

It is always great for me to meet the many VI-A alumni chosen to return as interviewers for their companies. The 13 this year are **Michael P. Chin**, '86, SM '87, AT&T Bell Labs; **Dean R. Collins**, '58, SM '59, Texas Instruments; **Chester M. Day, Jr.**, '57, SM '58, **David A. Martin**, '91, SM '91, and **Steven L. Rohall**, '87, SM '88, for Bell Communications Research (Bellcore); **Charles B. Dieterich**, '77, SM '78, the David Sarnoff Research Center; **Jenny M. Ford**, '81, SM '82, Motorola/Semiconductor; **Tomohiro Hasegawa**, '84, SM '85, Hewlett-Packard/Medical; **Gary K. Montress**, '69, SM '71, EE '71, PhD '77, Raytheon Research; **Thuan Q. Pham**, '90, SM '91, Hewlett-Packard Labs; **James W. Stamos**, '82, SM '82, EE '85, PhD '86, IBM/Almaden Research Center; **John A. Yasaitis**, '68, SM '70 (III), PhD '74 (III), Analog Devices; and **Marc A. Zissman**, '85, '86, SM '86, PhD '90, for MIT Lincoln Laboratory.

Another pleasure is to report on various honors and awards received by our alumni/ae and faculty. The IEEE has given its prestigious Founders Award to **Kenneth H. Olsen**, '50, SM '52, past president of Digital Equipment Corp., for "technical and management innovation, and leadership in the computer industry." He founded DEC in 1957.

Membership in the National Academy of Engineering has been given to Course VI Professor **Richard C. Larson**, '65, SM '67, EE '67, PhD '69, codirector of the Operations Research Center. Election is among the highest professional distinctions accorded an engineer. An alumnus, **Robert J. Spinrad**, PhD '63, VP for Technology Analysis and Development at the Xerox Corp., was also elected.

Just announced is that **Robert E. Anderson**, '62, '63 (XV), president and CEO at GenRad, Inc., since 1988, now becomes chair, filling the post left vacant when William R. Thurston retired in May 1992.

Honors received by VI-A students included: **Remigio M. Perales**, '93, one of 17 MIT students awarded a National Consortium for Graduate Degrees for Minorities in Engineering & Science Fellowship (the so-called GEM fellowships), of which 223 were awarded nationally. . . . **Guru Sivaraman**, '94, was one of 25 undergraduates named a 1993 Burchard Scholar by MIT's School of Humanities and Social Science. The scholars participate in special interdisciplinary meetings with faculty and visiting scholars.

MIT has announced that it will participate in a Wideband All-Optical Networks Consortium. Other consortium members are AT&T Co. and Digital Equipment Corp. Of interest to us is that the consortium director and leader of the MIT team is **Vincent W.S. Chan**, '71, SM '71, EE '72, PhD '74, associate head of Lincoln Lab's Communications Division. Plans are to build an experimental fiber-optic network between MIT and DEC as the prototype for a national high-speed data network which could be "the information superhighway for this country." Funding of \$8.4 million is from the Defense Advanced Research Projects Agency (DARPA).

Two VI-As were principal speakers at March chapter meetings of the Boston Section of the IEEE. **Ronald B. Goldner**, '56, SM '57, EE '59, professor of EE at Tufts University and cofounder and former acting director of Tufts' Electro-Optics Technology Center, was featured at the Lasers & Electro-Optics Chapter meeting. His talk was entitled "Electrochromic Smart Window Technology." . . . **Gary K. Montress**, the aforementioned staff member at Raytheon Co.'s Research Division, presented a talk entitled "State-of-the-Art SAW Oscillators: Design & Performance" at the meeting of the Ultrasonic Ferroelectrics & Frequency Control Chapter.

Finally, comments on alumni/ae with whom we've come into contact since last writing: **Geoffrey J. Bunza**, '74, SM '77, EE '78, PhD '81, of Beaverton, Ore., called, saying he expects to be in the Boston area this summer when his family vacations on Cape Cod and looks forward to a reunion with us. . . . **Glenn A. Kramer**, '84, SM '84, with Schlumberger/ATE in San Jose, Calif., whom I met in Kendall Square when heading for lunch with **Burnell G. West**, '60 (VIII) during the VI-A interviews. . . . **Jay W. Van Dwingelen**, '74, sent a holiday card telling of his keeping busy with two companies: he is executive VP at IRIS The Interactive System in Kirkwood, Mont., and Denver, Colo., and advisory systems analyst at Tandem Computers, Inc., in St. Louis, Mo. He's also regional chair for MIT's Educational Council.—**John A. Tucker**, director (emeritus), VI-A Internship Program, MIT, Room 38-473, Cambridge, MA 02139.

## VII BIOLOGY

**Peter S. Kim**, a member of the Whitehead Institute for Biomedical Research, has won the 1993 National Academy of Sciences Award in Molecular Biology for his path-finding research in structural biology. Kim, who is a Course VII associate professor and assistant investigator of the Howard Hughes Medical Institute, was honored for vital contributions in two separate



# Life in the Fast Lane

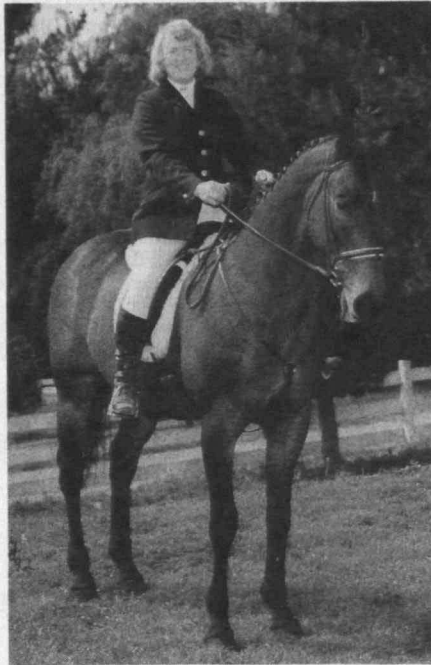
When Lawrence Livermore National Laboratory set out to produce a publication on its outstanding female scientists and engineers to encourage young women to consider technical careers, Carol Travis Alonso, PhD '70, was an obvious choice. Alonso lives a life that many bright and ambitious young women might well find very appealing—packed not only with her work as an accomplished scientist and administrator (and 1981–89 member of the MIT Corporation), but also with equestrian competitions, adventures in exotic locales, and close family life.

As assistant to the deputy director—a self-described “actions coordinator” for a small town—Alonso has major responsibilities for Lawrence Livermore’s more than 8,000 employees and billion-dollar budget. “While my boss, Deputy Director Duane Sewell, fields immediate problems from behind his desk, I am free to wander the facilities, observe people working, and see the problems they face,” she says. These may include a hazardous material spill, a missed safety regulation, or a questionable decision in financial management. “Her strength is in getting people to work together, to face issues, and to get on to the next problem,” says Sewell.

Born and raised in Canada, Alonso was directly influenced by the launch of Sputnik in 1957. General Electric transferred Alonso’s father, an expert in generator design, to Erie, Pa., shortly after the Soviet satellite was launched, and because of the military importance of his job, the Travis family was given automatic U.S. citizenship.

As a high school senior, she won a National Merit Scholarship that she opted to use to attend Allegheny College, a liberal arts institution only 50 miles from home. Her father thought it was a terrible mistake not to go to a larger, more prestigious university and to major in liberal arts, not sciences, but Alonso says, “I’ve never regretted [those choices] for a minute.”

Allegheny prepared her well enough



*Carol Travis Alonso and Palladian.*

to win National Science Foundation fellowships that supported her through a master’s degree in biophysics at Bryn Mawr College and MIT’s doctoral program in physics. During her years at MIT, she met and decided to marry fellow-physicist Jose Alonso, ’62, PhD ’67—but not before she had her own PhD in hand. One of her most vivid memories is of having her thesis 95 percent complete, feeling that she could finish in a matter of days. She entered accepted values into a computer problem and was stunned when the printout came out all zeros. Several agonizing months later, she realized that her initial failure had yielded a new “selection rule,” a general rule concerning the transitions that may occur between the states of a quantum-mechanical physical system. The thesis had to be rewritten, but her discovery was her ticket to six months of lecturing in Europe.

Upon her return, Carol joined Jose on the faculty of Yale. Then in 1973, the Alonsos were asked by Nobel laureate Glenn Seaborg to come to Lawrence Berkeley Laboratory to work on super-

heavy elements. Jose went on to the Bevelac accelerator and Carol joined Seaborg and a team of physicists whose work led to the discovery in 1975 of element 106, unnilhexium.

Jose is now deputy division leader in the Accelerator and Fusion Research Division at Lawrence Berkeley, and in 1975 Carol joined the research staff at Lawrence Livermore. By the mid-80s, she was managing 100 scientists working on thermonuclear design and was associate program leader for X-ray laser design. It was during these years that Alonso provided technical input in the policy area of nuclear test thresholds, testifying frequently before Congress. For eight years, ending in 1990, she served as Lawrence Livermore’s chair of a joint United States/United Kingdom working group for nuclear weapon design.

In the present era of changing national priorities, Alonso’s job is changing as well. These days, her almost weekly trips to Washington usually are spent with the Department of Energy, whereas a few years ago she met primarily with the Department of Defense.

Alonso’s recreational activities are as intense as her work. Most early evenings find her riding for a couple hours in the Orinda hills. When she decided to take up the sport seriously, Jose offered to purchase a horse as a birthday present. She opted to rescue Palladian, a six-year-old race horse—related to Secretariat—who kicked and bit anyone who came near him and was considered by handlers to be on his way to the dog-food factory. Eight years later, the pair wins blue ribbons in jumping and dressage.

Last summer the Alonso family, which includes son Christopher and daughter Laura, spent two weeks navigating a sailboat through the Caribbean. Other trips have included a sailboat cruise in the South Pacific and a trek in Tibet. An excursion to see Halley’s comet in the Peruvian Andes several years ago inspired a writing project for Carol Alonso—a recently completed young-adult novel about the Spaniards’ conquest of Peru. □—*Sherrie Saint John*



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areas: protein-folding research and the study of macromolecular recognition. The primary goal of Kim's research is to understand the transfer of information from one dimension to three dimensions. He received a \$20,000 cash prize and an illuminated scroll. Kim is the third member of the current Whitehead faculty to receive this award. The others are Gerald R. Fink (1981), and Robert A. Weinberg, '64, PhD '69 (1984).

## VIII PHYSICS

The Physics Department recently received a check for \$10,000 from *EDN* magazine for the Jerold R. Zacharias Professorship. The money was given on behalf of Jim Williams, *EDN*'s 1992 Innovator of the Year. Williams works at Linear Technology Corp. in Milpitas, Calif., and received the award for his ability to explain new technology to customers. As part of the award, a \$10,000 scholarship is donated to the college or university of the winner's choice. *EDN* is a leading electronic engineering magazine published by Cahners Publishing Co. in Newton, Mass.

Bernard T. Feld, a retired physics professor at MIT, died on February 19, 1993, in Brooklyn, N.Y. At age 21, Feld was asked to join the Manhattan Project, working with such minds as Albert Einstein to develop technology for the atomic bomb. In the early 1950s, he founded the Council for a Livable World and served as its president for many years. As a leader of the Pugwash movement, Feld also founded the Federation of American Scientists, a group that worked to end the arms race. Feld was an early president of the Albert Einstein Peace Foundation, which presented him an award two weeks before he died. He was also the editor-in-chief of the *Bulletin of Atomic Scientists*. For 40 years, Feld was a professor of physics at MIT, retiring in 1990. . . The Alumni/ae Association has been notified that Gerald J. Tawney, ScD '39, of Santa Barbara, Calif., died on December 22, 1992. No further information was provided.

## X CHEMICAL ENGINEERING

Peter Harriott, ScD '52, writes: "I am still teaching chemical engineering at Cornell University. I just finished the 5th edition of *Unit Operations of Chemical Engineering* with my coauthor, J.C. Smith." . . . David S. Hacker, SM '50, PhD '54, reports: "I am currently responsible for the Hazardous Chemical Process Laboratory and Thermophysical Properties Measurement Laboratory at Amoco Research Center in Naperville, Ill."

Donald E. Boynton, SM '47, ScD '49, of Kennett Square, Pa., died on December 23, 1992. Boynton was a Navy veteran of WWII, serving as a lieutenant commander. As captain of the LSM 193 he was awarded a Silver Star for saving the lives of more than 100 sailors aboard a ship that had been bombed by the Japanese. He retired in 1982 from Hercules Co., in Wilmington, Del., where he was a chemical engineer in the research center for 35 years. After retirement he worked part-time at H&R Block Co. He was a competitive bridge player and a member of the American Institute of Chemical Engineers. . . The Alumni/ae Association has been notified that George T. Chiu, PhD '73, of Wappingers Falls, N.Y., died on September 3, 1992. No further information was provided.

## X-A PRACTICE SCHOOL

As of this writing (late March), the Practice School expected a busy summer matching a busy spring, when 11 students were at the stations. Indeed, there's already a waiting list for both stations in all three terms of 1993-94 starting in September.

September will mark the end of an assignment for Lloyd Johnston, SM '91, as assistant director of the West Point Station (Merck); he'll return to graduate study in Cambridge. Meanwhile, two X-A graduates, having completed their doctorates late last winter, have moved on from Cambridge: Vishak Sankaran, SM '88, PhD '93, is a research engineer at General Electric's super abrasives plant in Columbus, Ohio, and Xinjin Zhao, SM '90, ScD '93, is with W. R. Grace, Columbia, Md.

Norman Greenman, '47, SM '48, has retired as chair of the board of Rogers Corp. in Willimantic, Conn. He joined the firm as a product development engineer in 1948—44 years ago—after finishing the Practice School, became VP for operations in 1961 and president and CEO in 1966. . . From Bombay, where he is technical director of Bombay Oil Industries, Ltd., Kishore V. Mariwala, SM '59, reports two honors: he has been elected president of the Indian Chemical Manufacturers Association for 1992-93 and last spring served as the Professor J. G. Kane Visiting Professor in Chemical Technology at the University of Bombay.

Eugene L. Grumer, SM '64, CHE '65, notes that Practice School is not always a prelude to an engineering career. After finishing at MIT, Grumer went to work at the Celanese Technical Center, where it was agreed that he would rotate through several departments. "Somewhat arbitrarily," writes Grumer, "I started in economic evaluation, which is where I suspended my longer-term interest rested. But I never transferred to pilot plant or plant technical service. I soon took a job with my present company [Amerada Hess Corp., Port Reading, N.J.] in planning and economics," says Grumer, and he's been in that field ever since. . . Among the comments of Practice School alumni for the 75th anniversary history (*The Flagship*, of which copies are still available) was a similar observation about the vagaries of career paths from William T. van Ravenswaay, '44, in Bedford, Tex.: "My career included a variety of work much of which was neither chemical nor even engineering. I started as a 'sample grabber' at a butadiene plant in Texas and progressed through process design of early catalytic crackers." Then van Ravenswaay went into service abroad and did engineering work in transportation and refining of crude in Bahrain, Sumatra, the Philippines, and Australia, and was project manager for design and construction of an ammonia plant in Spain. Back in New York, he did "contract administration and contracting for overseas petroleum/natural gas/petrochemical projects. My last job before retirement was developing a worldwide (65 countries) crude loss-control program for Caltex Petroleum Corp." Though he doesn't remember specific fallout from the Practice School to his career, van Ravenswaay says he has "an overall feeling that I was comfortable in moving from MIT into the 'real world' and that the Practice School boosted my confidence in attacking any problem, whether I knew anything about the subject initially or not." Those comments are especially interesting in view of the fact that van Ravenswaay graduated not from X-A but from X-B, the undergraduate Practice School curriculum that was discontinued in 1962.



From Summit, N.J., Robert S. Smith, SM '47, writes that since retiring in 1973 he's been working as a part-time tutor and instructor at Fairleigh Dickinson University. "I teach courses in management science and statistics and tutor math through Calculus III plus various courses in business and economics, even a little accounting. I enjoy the work immensely, and I thank MIT for the preparation that helped make it possible."—John Matill, *Technology Review*, MIT, W59-200, Cambridge, MA 02139.

## XI URBAN STUDIES AND PLANNING

Dowell Myers, PhD '81, sends word from Altadena, Calif.: "My new book, *Analysis with Local Census Data: Portraits of Change* (Academic Press), has been well-received in the Census Bureau and elsewhere. Sometimes planners know more than demographers!" ... Edward H. Kaplan, SM '79, MCP '79, SM '82 (XVIII), PhD '84, associate professor of policy modeling and public management and of medicine at Yale University, writes: "I was awarded the 21st Edelman Prize, the world's top award for practice of management science for evaluation of New Haven's Legal Needle Exchange. I was also named associate editor of the *Journal of Acquired Immune Deficiency Syndrome*. I was named the Lady Davis Visiting Professor at Hebrew University of Jerusalem for spring 1994." ... Douglas H. Johnson, PhD '79, has been named VP and managing partner at M. Van Leesten Associates, Inc. Previously he was CEO and president of Peerless Precision, Inc. Both companies are in Providence, R.I. ... Adriana N. Staderker, MCP '73, PhD '76, has been named VP for executive operations at Digital Equipment Corp. in Maynard, Mass. Staderker moved from her position as manager of personnel at DEC. ... Deborah C. Jackson, '75, president and CEO of Morgan Memorial Goodwill Industries, Inc., has been presented with the 1993 Amelia Earhart Award by the Women's Education and Industrial Union (WEIU). Presented since 1982, the award honors one outstanding woman in greater Boston who has significantly contributed to the advancement of opportunities for women. It is named for the famous aviator, who sought job counseling at the WEIU's Career Services Department two years before she became the first woman to cross the Atlantic in an airplane. Jackson's selection was based upon her leadership and innovative achievements in both the community and health care network. She is the first female president in Morgan Memorial Goodwill Industries' history, and the first African-American president of any Goodwill Industries operation nationwide. ... A reception was held for Phillip Clay, PhD '75, in honor of his appointment as Course XI department head during the Professional Development Institute held in February. More than 50 alumni/ae, graduate students, and administrators attending the ceremonies.

## XII EARTH, ATMOSPHERIC, AND PLANETARY SCIENCES

Bill Corea, SM '78, PhD '81, writes from San Ramon, Calif.: "I have been named a 'Distinguished Lecturer' for the Society of Professional Well Log Analysts for 1993. Recently, I spoke at meetings of the San Joaquin Valley and Southern California Logging Society meetings, on the topic of 'Borehole Imaging.'" ... Vincent Wilczynski III, SM '87, SM '87 (XIII),

reports: "After receiving a PhD from Catholic University in mechanical engineering, I am now teaching at the U.S. Coast Guard Academy." ... Robert C. Clark, Jr., SM '66, received the Gold Medal, the highest award given by the U.S. Department of Commerce, for "rare and distinguished contributions of major significance to the department, the nation, or the world." Clark, as part of a five-member team from the National Oceanic and Atmospheric Administration (NOAA), contributed to successful U.S. emergency response to the environmental aftermath of the Persian Gulf War. The team coordinated U.S. atmospheric and marine response programs in the Middle East, and its members were cited for often putting themselves at significant risk, braving adverse conditions, and coping with serious obstacles. Clark served as the expedition leader of the UN-sponsored, multidisciplinary, 100-Day oceanographic Cruise of the NOAA ship M.T. Mitchell, which hosted over 140 scientists from 14 countries. Clark is currently director of the Restoration Center Northwest located in the National Marine Fisheries Service's Northwest, Regional Office in Seattle, Wash. ... Mention of two alums at Carnegie Mellon Institution: Sean C. Soloman, PhD '71, was appointed director of the Department of Terrestrial Magnetism last September. A former MIT professor, Soloman focuses his research on the interiors of the Earth and other planets, working extensively with seismological evidence. He served at MIT for most of his career, starting as assistant professor in 1972 and moving through to professor in 1983. Soloman is a member of the Lunar and Planetary Science Council of the Universities Space Research Association. ... David Greenewalt, PhD '60, was elected to the board of trustees at Carnegie Mellon. He has been a geophysicist/oceanographer at the U.S. Naval Research Lab since 1966. He served as an instructor and lecturer at MIT before joining the lab.

The Alumni/ae Association has been notified that William R. Chalker, SM '48, MET '49, of Ocean City, N.J., died on April 9, 1992. No further information was provided.

## XIII OCEAN ENGINEERING

Vice Admiral Clarence R. Bryan, NE '52, writes: "I was awarded the Distinguished Public Service Medal for contributions as chair of the advisory board to the U.S. Coast Guard Academy in Washington, D.C." ... John W. Waterhouse, SM '84, reports: "I started the Elliott Bay Design Group, Ltd., in January 1989 in Seattle, Wash. I have two other partners and I am president." ... From Arlington, Va., Arthur Dennis Long, SM '75, sends word: "I am at the U.S. Agency for International Development and work as environmental officer for the New Independent States (former Soviet Union)." ... From Stafford, N.H., Captain Robert L. Evans, SM '37, writes: "10 years of New Hampshire 'Math Counts' for 7th and 8th grade students. A pool for future engineers!" ... Peter Bowman, OCE '73, SM '73 (XV), writes: "I was recently promoted to VP for quality assurance in the Circuit Protection Division at Gould, Inc., in Newburyport, Mass. I am implementing TQM and international quality standard (ISO)." ... Vincent Wilczynski III, SM '87, SM '87 (XII), reports: "After receiving a PhD from Catholic University in mechanical engineering, I am now teaching at the U.S. Coast Guard Academy." ... Commander Peter C. Filkins, SM '91 (II), NE '91, USN, sends word from Bremerton, Wash.: "Since graduation, I have attended engineering duty

officer school, graduating first in my class. I am now working at Puget Sound Naval Shipyard as the carrier-type desk officer, after working as a ship superintendent and project manager for the USS Nimitz." ... From Kittery, Maine, Peter Bowman, OCE '73, SM '73 (XV), writes: "I was recently promoted to VP of quality assurance for the Circuit Protection Division at Gould, Inc., in Newburyport, Mass. I am implementing TQM and international quality standard (ISO)." ... Robert J. Bosnak, SM '60, NE '60, sends a copy of his retirement summary from Bethesda, Md.: "I retired from my position as deputy director in the division of engineering, Office of the Nuclear Regulatory Branch, U.S. Nuclear Regulatory Commission (NRC) on February 20, 1993. I joined the Atomic Energy Commission in 1972 after retiring as a Coast Guard officer with the rank of captain, with over 24 years of commissioned service. The regulatory function of the AEC was moved to the NRC when the latter was established by an act of Congress in 1974. During both my Coast Guard and AER/NRC careers, I focused much of my time on the development and maintenance of standards to assure the safety of mechanical engineering equipment typically used in commercial maritime and commercial nuclear power plant applications. In addition, as a member of the Main Boiler and Pressure Vessel Committee of the ASME from 1968-92, my scope of standards activities covered the components and systems used for petroleum, chemical, and electric power generation, and other engineering applications requiring pressurized mechanical equipment." He continues: "My continued participation over 28 years in the national consensus codes and standards programs of the ASME was a common link joining my Coast Guard and NRC careers. I was instrumental in getting both federal agencies to adopt portions of the ASME Boiler and Pressure Vessel Code into their regulations. In 1967 I received the Secretary of Transportation Achievement Award for modernizing the Coast Guard marine engineering regulations. I received the ASME Bernard F. Langer Nuclear Codes and Standards Award in 1983, was elected a Fellow of ASME in 1986, and received the ASME Codes and Standards Medal in 1990. The NRC in 1990 selected me to receive the Engineer of the Year Award from the National Society of Professional Engineers." At retirement Bosnak received an NRC plaque recognizing his 49 years of federal service, along with a letter from President Clin-

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ton commending his "dedication to our nation." ... Navy Lieutenant **Zan E. Miller**, SM '92 (III), OCE '92, recently graduated from the Engineering Duty Officer Course at the Engineering Duty Officer School in Mare Island, Vallejo, Calif.

Rear Admiral **James M. Farrin, Jr.**, SM '34 (USN, ret.), of North Palm Beach, Fla., died on December 22, 1992. Farrin was awarded the Legion of Merit, bronze star medal with gold star, the American Service Medal, and other campaign medals during his 40-year service career. His assignments included head of Ship Design for the Polaris Submarine Program and shipyard commander for Philadelphia, Pearl Harbor, and Norfolk Naval Shipyards. He was assistant division manager of Surface Effect Ships Division of Aerojet General, retiring in 1973. Farrin and his son were four times ranked number two in the U.S. in Father and Son Tennis, and seven times New England Champions. ... The Alumni/ae Association has been notified of the following deaths: Commander **Frank P. Omohundro**, NE '49, of Ponte Vedra Beach, Fla., on February 6, 1993, and Captain **Charles R. Watts**, SM '33 (USN, ret.), of Kensington, Md., on January 11, 1992. No further information was provided.

## XIV ECONOMICS

The MIT Economics Department has made quite a splash in Washington, D.C., with the Clinton Administration. **Laura D'Andrea Tyson**, PhD '74, an associate professor at the University of California's Department of Economics, has been nominated and confirmed as chair of the Presidential Council of Economic Advisers. **Alan S. Blinder**, PhD '71, professor of economics at Princeton University, and **Joseph E. Stiglitz**, PhD '66, from Stanford University, are being considered for the council's two remaining seats. **Lawrence F. Katz**, PhD '86, a Harvard professor, has been named chief economist in the Department of Labor, and Harvard's **David M. Cutler**, PhD '91, is expected to work for the National Economic Council. Add Secretary of Defense **Les Aspin**, PhD '66, and MIT's presence is everywhere! ... **Eugene Flood, Jr.**, PhD '83, was featured in an article in the October 1992 issue of *Black Enterprise* magazine, "The 25 Hottest Blacks on Wall Street." He is principal of mortgage-backed securities at Morgan Stanley.

**John C. Eddison**, PhD '55, of Lexington, Mass., died on January 22, 1993. In WWII, Eddison served as a captain with the U.S. Army Corps of Engineers, building air strips in New Guinea and the Philippines. From 1955-63, Eddison served as an economic development consultant for the governments of Puerto Rico, Burma, and Pakistan. In 1963 he joined the U.S. Agency for International Development and served as the first deputy director of the mission in La Paz, Bolivia. Later, in Washington, D.C., Eddison served as deputy director of Aid for Central America and director of Aid for the Near East. Eddison worked with the Harvard Institute for International Development from 1970-80, first in Bogota, Colombia, and then at the institute's headquarters in Cambridge. From 1980-84 he was executive VP of Warner-Eddison Associates, Inc., which evolved into Inmagic, Inc., a software firm in Cambridge.

## XV MANAGEMENT

**William M. Kantor**, SM '84, writes: "I am still working at Teradyne, currently as regional

sales manager. I'm living in Wayland, Mass., with my wife, Connie, and two-and-a-half-year-old daughter, Amy." ... **J. Thomas Sell-dorff**, SM '59, reports: "I recently completed the acquisition of a company in the Czech Republic for Sanborn, Inc., my employer in Wrentham, Mass. Negotiating in an emerging ex-communist country was a fascinating, occasionally frustrating, but eventually very satisfying experience. Lots of opportunities in eastern Europe for the patient and selective U.S. companies." ... **Miles Harbur**, SM '77, is COO of print at the Christian Science Publishing Society. He writes: "I just moved to Boston for the church position and I also set up an active management consulting business while living outside Manhattan last year. Married 20 years this May—three sons—life is great!" ... **Makoto Sawai**, SM '87, reports: "After two years' assignment in planning and coordinating the capital market activities of the bank, now I am at the Sanwa Bank's Hong Kong office working on designing the loan portfolio management system." ... From San Mateo, **Don Ravey**, SM '61, sends word: "I retired from Unisys, but I'm teaching computer classes part-time at the College of San Mateo and doing some consulting. I'm very active with the MIT Club of Northern California." ... **Scott McCan**, SM '88, sends word from Westfield, Ind.: "Karrie and I have one child, Christopher, age two, and are expecting again in July. I am manufacturing engineering supervisor for Delco Electronics in Kokomo, Ind." ... **Michael Peterson**, PhD '92, writes from Bloomington, Ind.: "I have been assistant professor of public and environmental affairs in the School of Public and Environmental Affairs at Indiana University since September 1992." ... From Kittery, Maine, **Peter Bowman**, SM '73, OCE '73 (XIII), writes: "I was recently promoted to VP for quality assurance in the Circuit Protection Division at Gould, Inc., in Newburyport, Mass. I am implementing TQM and international quality standard (ISO)." ... **Aliza Blachman**, SM '90, and **Graham O'Keeffe**, SM '90, were married on Cape Cod on September 12, 1992, in the company of many friends from Sloan. They have since returned to the U.K. after spending most of 1992 in Hong Kong. Blachman returns to McKinsey's London office and O'Keeffe is now responsible for world-wide manufacturing planning for Nokia Mobile Phones. ... **Alexander Rossolimo**, SM '73, writes: "I am now president of International Strategy Associates, a management consulting firm in Newton, Mass., specializing in business strategy. Its focus is on growth companies and companies that aspire to grow. Its international activities extend to the U.S., Europe, Japan, and the CIS." ... **Himat A. Shah**, SM '85, has been named senior VP for marketing at Keyfile Corp. in Nashua, N.H. Previously he was VP for marketing at Micrografix, Inc., in Richardson, Tex. ... **Melinda L. Lindquist**, SM '84, has been named director of planning and administration/scientific affairs at Genetics Institute. Prior to this post, she was manager at the Cambridge-based firm. ... Century Bank and Trust Co., a state-chartered commercial bank and subsidiary of Century Bancorp, Inc., recently announced the promotion of **Paul V. Cusick, Jr.**, SM '71, to executive VP and treasurer. Cusick, previously the senior VP and treasurer of Century Bank and Trust Co., will continue to oversee corporate financial management, planning, and investment decisions. ... **Sandra L. Helton**, SM '77, has been named president of the board of trustees of the Rockwell Museum in Corning, N.Y. Helton is VP and treasurer of Corning, Inc. ... **Bruce David Weinberg**, PhD '93, has been named an assistant professor of

marketing at Boston University's School of Management. A specialist in new product development, automobile marketing, and the impact of multi-media and high technology on consumer decision-making, Weinberg was an instructor at BU from 1985-86. He has also held teaching positions at Tufts University and Babson College. A former project engineer for Scientific-Atlanta in Burlington, Mass., Weinberg was named a doctoral consortium fellow of the American Marketing Association in 1990 and a Sloan Fellow in 1986. ... **Michael A. Connolly**, SM '82, and **Robert A. Rimer** are the authors of *HIV+: Working the System* (Alyson Publications, 1993). Larry Kessler of the National Commission on AIDS made this comment about the book: "This is a provocative, eye-opening tour of the health care system, as it lurches from crisis to crisis. The authors show people with HIV how to extract good care from the system, and how to avoid being stepped on by it." Connolly has worked with most New England AIDS service organizations as a management consultant. He previously worked with the AIDS Action Committee of Massachusetts.

**Barbara Ann Benjamin-Kops**, SM '80, of Holland, died January 14, 1993. Benjamin-Kops worked for Market Facts in New York City prior to attending MIT. She worked for General Mills in Minneapolis before marrying Robert Kops of Amsterdam. She learned to speak and write Dutch fluently and resumed her professional career with ABN-AMRO Bank in Holland as operations coordinator between American banks and ABN-AMRO. ... The Alumni/ae Association has been notified that **Nicholas J. Penny**, SM '87, of Cape Town, South Africa, died June 23, 1992. No further information was provided.

### Sloan Fellows

**Alberto Rial**, SM '86, writes: "After resigning from the Venezuelan oil industry in January 1991, I spent a year in Madrid, Spain, as a consultant for Spanish Oil Co. I returned to Venezuela in July 1992 and established my own consulting firm, AR&M Consultores. I am working in the areas of strategy, structure, and culture, and doing some technical work in the oil business (E&P and marketing analyses)." ... **F. Duane Ackerman**, SM '78, has been named president and CEO at BellSouth Telecommunications, Inc. He had been CEO of BellSouth Services, Co. Ackerman has also recently been named a member of the board of directors at American Business Products, Inc., in Atlanta. ... **Daniel J. Sutherland**, SM '88, has been named VP for strategic marketing at U.S. West, Inc. He had been executive director of carrier marketing at U.S. West Communications. Both companies are located in Denver, Col. ... GTE



**Armen Der Marderosian**

Government Systems Corp. announced the merger of two of the company's units into a single sector directed by **Armen Der Marderosian**, SM '75, group VP and general manager. The newly formed Government Sector, headquartered in Needham, Mass., combines the Command, Control and Communications Systems Sector in Needham and the Electronic Defense Sector in Mountain View, Calif. The new unit comprises



approximately 6,850 employees in four divisions. Der Marderosian joined GTE in 1963. In 1979, as VP and general manager of GTE Iran, headquartered in Tehran, Der Marderosian led the GTE group's escape from the country when the U.S. Embassy was seized. Prior to his current post, he was group VP and general manager of a GTE sector in Taunton, Mass., where he was responsible for the U.S. Army's \$4.3 billion Mobile Subscriber Equipment program, the largest communications contract ever awarded by the Army.

**Robert M. Mix**, SM '52, of San Diego, Calif., died on December 12, 1992. Mix worked at U.S. Steel Companies in industrial engineering and in their railroad subsidiary, the Duluth Missabe and Iron Range Railway Co. in port cities. He became involved with major methods improvements and worked as assistant to the president. He was also a director and/or president of numerous civic organizations. Mix retired in 1974 after 33 years with U.S. Steel. He was active with the Service Corps of Retired Executives, assisting small businesses and serving as a volunteer with a community income tax program, assisting the low income and elderly. His many associations included the MIT Club and Scottish Rite, both of San Diego. . . . **Herb S. Holdsambeck**, SM '60, (USAF, ret.) of Huntsville, Ala., died on October 5, 1992. Holdsambeck flew with the 99th Bomb Group in WWII. During his Air Force career, he was involved in the space program as Test Wing Commander both at Patrick and Vandenberg Air Forces Bases. After his retirement, he worked at United States Boosters in Huntsville, Ala. . . . **Daniel F. Cameron**, SM '59, of Edmonds, Wash., died on March 28, 1992. Cameron was retired from Conoco Oil Co., one of the nation's largest when it was absorbed by DuPont in 1981. He was an avid sailor, skier, and golfer. During his years with Conoco, Cameron served in several overseas assignments. He was the project engineer at the firm's oil refinery in Tokyo from 1967-69. He designed a new process for refining petroleum coke, and the plant was designed around the process. He was the manager and oversaw the construction of the refinery. He also served for many years as the manager of the Humber River Refinery on the east coast of England. During this time, Cameron kept some pretty lofty company, playing golf on occasion with Denis Thatcher, husband of former British Prime Minister Marget Thatcher, according to one of his sons. Cameron and his first wife, Nancy, were foster parents to as many as 10 children and helped pay educational costs for several foreign students who were attending school in the U.S.

#### Senior Executives

Navy Captain **George Galdorisi**, '91, commanding officer of the USS *Cleveland* in San Francisco, writes: "I have won two writing competitions sponsored by the U.S. Naval Institute. My essay 'China's Navy After Tiananmen Square' won first runner-up in the International Navies Essay Contest and my essay 'A Maritime Strategy for the Twenty-First Century' won first runner-up in the Arleigh Burke Essay Contest." . . . From Sandton, South Africa, **Chris Reay**, '82, reports: "I formed my own business, Chris Reay and Associates, in 1990, consulting in total quality management. I am an associate of several other organizations including a multidisciplinary management consulting network. I am active in the promotion of the engineering profession, am part-time director of the Society for Professional Engineers, and a past president of the Institution of Mechanical

1921-1993

## Phyllis A. Wallace

### *A Quiet Revolutionary*

**P**hyllis A. Wallace, professor emerita of management in the Sloan School, died January 10, 1993. Wallace was a labor economist who pioneered the study of gender and racial discrimination in the workplace. Her contributions were acknowledged in a number of lengthy obituaries, most notably in the *Boston Globe*, from which much of this article was taken.

Wallace's career also included service in government, on corporate boards such as the State Street Boston Financial Corp., and on the boards of such institutions as Boston's Museum of Fine Arts and the Brookings Institute. The culmination of her career came in a 1973 federal court ruling against AT&T. Wallace led the scholarly work in the case and produced evidence that AT&T had discriminated against women and minority men. The court obliged AT&T to pay back wages, adjust pay rates, and change promotion and recruitment criteria, in a decision that reverberated throughout American industry. Wallace's achievement was recognized in 1983 when Mount Holyoke College conferred on her an honorary doctor of laws degree. The citation read: "Beginning your career at a time when neither blacks nor women had a fair chance, you have seen great progress toward equal employment opportunity—progress due in no small measure to your scholarship on the economics of discrimination in the labor market."

Wallace wrote several books, among them *Equal Employment Opportunity and the AT&T Case*; *Women, Minorities, and Employment Discrimination*; *Pathways to Work: Employment Among Black Teenage Females*; and *Black Women in the Labor Force*.

Associate Professor of Management Lisa Lynch described her former mentor as a "quiet revolutionary. She had an amazing ability to pull people together from diverse communities . . . to meet, discuss, exchange ideas, and to set up

new institutions that would work to the continuation of what she called 'the human revolution.' And once you were a friend of hers, you were part of a community of friends . . . people who would never have been brought together in any other way."

After receiving a PhD at Yale in 1948, Wallace joined the National Bureau of Economic Research as an economist and statistician while teaching part-time at the City College of New York. From 1953-57 she was on the faculty of Atlanta University and then became senior economist for the U.S.

government, specializing in Soviet economic studies. She served with the office of research in the Equal Employment Opportunity Commission (EEOC) from 1966-69, and as VP of research for the Metropolitan Applied Research Center from 1969-72. She then joined the Sloan School as a visiting professor and in 1975 became the school's first woman promoted to full professor.

When Wallace retired from the Sloan School in 1986, scholars in her field from around the world gathered at MIT to honor her. The Sloan School endowed the Phyllis A. Wallace Doctoral Fellows Fund to provide assistance to African-Americans entering the school's PhD program, as well as the Phyllis A. Wallace Visiting Scholars Fund to support black academics working at Sloan.

At "A Gathering to Remember Phyllis Wallace" in February at MIT, Dean Lester Thurow recalled that when Wallace was the assistant director of research at the EEOC, she awarded him his first research grant, which enabled him to write his first book, *Poverty and Discrimination*. He was at the time an assistant professor at Harvard. It was Thurow who then brought her to the attention of MIT a few years later. "If I was ever asked to enumerate the good things I had done for MIT, she would be right at the top of my list," he said. □





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Engineers." . . . Michael F. Mee, '84, changes a feather in his cap at Wang Laboratories, Inc., in Lowell, Mass.. Previously executive VP and CFO, Mee is now chair and CFO. . . . Harry P. Kamen, '82, has been named CEO at Metropolitan Life Insurance Co. Prior to this appointment, Kamen was senior executive VP at the New York City-based firm. He has also been named to the board of directors at Bethlehem Steel Corp. in Bethlehem, Pa. . . . Stuart H. Theis, '85, is assistant to the president at Oglebay Norton Co. Previously, he was VP for energy resources and special projects at M.A. Hanna Co. Both companies are in Cleveland, Ohio. . . . Joseph T. Brophy, '87, retired on March 31, 1993, as president of Travelers Managed Care and Employee Benefits Operation at Travelers Corp. in Hartford, Conn. . . . Charles R. Sitter, '67, has been named president of Exxon Corp. in Irving, Tex. Sitter was senior VP before this move.

George T. Richardson, '75, of New Iberia, La., died on January 24, 1992. Richardson served in the Coast Guard from 1945-48. He was a senior petroleum engineer for Humble Oil & Refinery Co. from 1948-55. He was the coinventor of the turret mooring system. Richardson was a former president and COO of the Offshore Co., and director and VP of Southern Natural Resources, Inc. He also was director of the International Association of Drilling Contractors & Society of Petroleum Engineers and a member of the board of directors of Global Marine. . . . Robert H. Graulich, '91, of Canandaigua, N.Y., died on September 1, 1992. Graulich began his career with Eastman Kodak Co. in 1960. Through the 1970s he managed several of the U.S. regional distribution centers and in 1984 the board of directors elected Graulich as corporate VP and general manager of the Worldwide Distribution Division. During his employment with the company, he was a member of the American Management Association, Purchasing, Transportation, and Physical Distribution Council, and the Council of Logistics Management. In the spring of 1992, he retired after 32 years of service. . . . Kenneth H. Cutt, '65, of Toronto, Ontario, died on October 5, 1992. Cutt was a former VP of the Canadian Imperial Bank of Commerce and a flying officer during WWII in the 426th Thunderbird Squadron of the Royal Canadian Air Force.

The Alumni/ae Association has been notified of the following deaths: Edward G. Kondas, '62, of Cleveland, Ohio, on October 6, 1991; Robert K. Treichler, '67, of Williamsburg, Va., on October 17, 1991; Edwin F. Alder, '67, of Indianapolis, Ind., on March 6, 1992; Frank W. Burr, '57, of Teaneck, N.J., on May 4, 1992; Arthur B. Hersberger, '56, of Haverford, Pa., on September 25, 1992; and Bengt Ison Sjogren, '66, of Stockholm, Sweden, on November 10, 1992. No further information was provided.

### Management of Technology Program

Alex Karpovsky, SM '91, reports that his company, Computers on a Platter, is prospering. He is still working on penetrating the Russian market and says that he remains "forever an optimist." . . . Stephen C. Laughton, SM '91, is now working for Koenenman Capital Management, which has a "very impressive management team," many of whom are MIT grads. In mid-March he attended a week-and-a-half seminar in the Peoples Republic of China, meeting with government officials, PRC executives, and multinational executives in several cities, including Shanghai. . . . Lyle Hart, SM '92, and his wife, Bette, are building a new house in

Raleigh. This will be the fifth house they have built in 15 years. Lyle is working on the "Value Point" PC at IBM. He reports that demand is so great they are having trouble keeping up with it.—MOT Program Office, MIT, Room E56-304, Cambridge, MA 02139.

## XVI AERONAUTICS AND ASTRONAUTICS

Arye R. Ephrath, SM '72, PhD '75, writes: "I was elected a Fellow of the IEEE in December 1992, for contributions to the field of human-computer interactions." . . . Theodore H.H. Pian, SM '44, ScD '48, Course XVI professor emeritus, reports: "In mid-September 1992, I went to Central University at Chung-Li in Taiwan and gave a six-week course on finite element methods. Then I visited and lectured at 12 universities in five major cities on the mainland. I received an appointment of honorary professor in Hohei University in Nanjing. (I am now holding such appointments at eight Chinese universities). I was also in residence at the University of Hong Kong for two weeks before returning home to Cambridge before Christmas." . . . Robert L. Spilker, SM '72, ScD '74, has been elected a Fellow of AMSE. Spilker is a professor of mechanical engineering at Rensselaer Polytechnic Institute in Troy, N.Y., and is a world-renowned researcher in computational mechanics and biomechanics. He has made important contributions to the study of the mechanical behaviors of soft biological tissue through the development and application of new and novel finite element techniques. Spilker has developed finite element codes that are being used by researchers in orthopaedic biomechanics to study and understand the tissue's response to mechanical loadings. A member of ASME since 1977, Spilker is chair of the Biomechanics Division.

Lieutenant Colonel Brian T. Hastings, SM '54, (USAF, ret.) of Boston, died on March 4, 1993. During WWII, he fought in the South Pacific and the Philippines. He was decorated with the Air Medal with three oak-leaf clusters, the Asiatic Pacific Theatre Ribbon with seven Bronze Stars, the WWII Victory Medal, and the American Theatre Medal. He served at Wright Patterson Air Force Base in Ohio. During his more than 20 years of service, Hastings was stationed in Wiesbaden, Germany, Colorado Springs, Colo., and Hanscom Field in Bedford, Mass. After retiring from the USAF in 1967, Hastings worked at RCA in Cambridge and in the real estate field in the Boston area. He was a member of the U.S. Power Squadrons and served for many years as elected lieutenant of the Boston Power Squadron.

## XVII POLITICAL SCIENCE

M. Lourdes Melgar Palacios, SM '88, PhD '92, writes: "After 10 years of studying abroad, I'm back in Mexico. I am having a wonderful time, and have a great job in the Coordinación de Asesores de la Oficina de la Presidencia. But I miss very much my MIT friends and the Charles River, but not the weather!" . . . Charles H. Ferguson, PhD '89, and Charles R. Morris are the co-authors of an article in the March-April *Harvard Business Review* "How Architecture Wins Technology Wars" is based on their recently published book, *Computer Wars: How the West Can Win in a Post-IBM World* (Times Books). Ferguson, a former researcher at MIT, is an independent computer consultant.



## XVIII MATHEMATICS

Jerry Grossman, PhD '74, sends word from Rochester Hills, Mich: "I received Oakland University's Teaching Excellence Award for 1992." Grossman is an associate professor in the Math Department at Oakland U. . . . Robert J. Rahn, PhD '72, writes: "I have been chair of the doctoral program in the Faculté des Sciences de l'Administration at the Université Laval since September 1992." . . . Howard W. Kreiner, SM '54, who retired in 1992 after 35 years at the Center for Naval Analyses, writes: "In August 1992, the Operations Research Society of America published my book *Fields of Operations Research*. The book describes analyses I did of naval operations while working with the U.S. Navy in the field and at sea through its Operations Evaluation Group (formerly managed by MIT) and the Center for Naval Analyses between 1951-89." . . . Robert R. Reitano, PhD '76, was awarded the Society of Actuaries annual prize for his research paper "Multivariable Duration Analyses." The society awards the prize to the best paper written by a member to be printed in the scholarly journal *Transactions*. Reitano is senior investment policy officer and director of research in the investment policy department at John Hancock Mutual Life Insurance Co. of Boston. . . . James Gordon Simmonds, '57, SM '58 (XVI), PhD '65, has been elected a Fellow of ASME. Simmonds is a professor and chair of the Department of Applied Mathematics at the University of Virginia in Charlottesville. He is described as a respected teacher and leader in applied mechanics for more than 30 years who has made significant contributions to the understanding of the behavior of plates and shells. Simmonds had done theoretical research on large flexible spinning disks and curved membranes (for deployment as radar reflectors, solar sails, and antennas in space), and the development of a 15-inch container to carry mice aloft for three days in a high-altitude balloon. He has published more than 80 articles. A member of ASME since 1979, Simmonds is active in the Applied Mechanics Division.

The Alumni/ae Association has been notified that Hubertus J. Weinitschke, PhD '58, of Erlangen, Germany, died on December 5, 1991. No further details were provided.

## XX APPLIED BIOLOGICAL SCIENCES

Sheila Collins, PhD '85, writes: "I'm living in Durham, N.C., and have been a faculty member at Duke University Medical Center since February 1992. Previously, I was a postdoctoral fellow with Robert Lefkowitz in the Department of Biochemistry at Duke University." . . . William J. Goldman, SM '64, sends word from Ambler, Pa.: "I am currently medical director at Schering-Plough Health Care Products." . . . Ronald V. DiPaolo, PhD '72, was elected a member of the board of the New England Baptist Hospital for a four-year term. DiPaolo is the director of operations at Boston Biomedica, Inc. . . . Ellen Mara Kramer, SM '79, was honored by Northeastern University for her 10 years of teaching at University College, the part-time undergraduate division. Kramer, nutrition instructor for the Health Professions and Science Program, is an independent consultant and the editor-in-chief of *Nutrition Planning*, an international quarterly journal about food and nutrition policy, planning, and programs.

## XXII NUCLEAR ENGINEERING

Patrick M. Hogan, SM '89, writes: "I am currently a senior engineer/project engineer with ABB Impell Corp., in Lincolnshire, Ill. I was most recently the project engineer on a \$800K project which provided engineering analyses to support modification design and outage planning for a local nuclear power plant." . . . Navy Lieutenant j.g. Michael J. Wilson, SM '91, recently graduated from the Submarine's Officer's Basic Course. During the 12-week course at the Naval Submarine School in Groton, Conn., students are taught the theory, construction, and operation of nuclear-powered submarines.

## TPP TECHNOLOGY AND POLICY PROGRAM

Shashi K. Sharma, SM '92, is currently on staff with Persistent Systems Pvt., Ltd., in Pune, India. Shashi writes that "they are primarily in computer software development and shall be glad to hear from anyone interested in doing business with them." . . . Jeanne Briskin, SM '83, is the deputy director of the Global Climate Change Division in the Office of Air at EPA. Prior to this position, Jeanne spent six months in the Seattle Regional Office. . . . Bhavya Lal, '90, SM '90 (XXII), SM '92, was married in January 1993. Congratulations! . . . J. Steven Thomas, SM '92, has joined the staff of Vector New England as the marketing manager.—Richard de Neufville, TPP, MIT, Room E40-252, Cambridge, MA 02139.

## Deceased

The following deaths have been reported to the Alumni/ae Association since the *Review* last went to press:

Han H. Huang, '17; January 26, 1993; Palo Alto, Calif.  
Harold W. Bibber, '20; November 11, 1990; Columbus, Ohio  
David H. Flashman, '20; February 1, 1993; Taunton, Mass.  
Henry P. Massey, '20; January 26, 1993; Readville, Maine  
Benjamin C. Morse, Jr., '20; January 13, 1993; Columbus, Ohio  
Louis Mandel, '21; January 1, 1993; Hollywood, Fla.  
Harold R. Bjerke, '23; November 11, 1992; Oslo, Norway  
Charles E. Loud, '23; February 15, 1993; Hingham, Mass.  
Roscoe H. Smith, '23; January 24, 1993; Cleveland, Ohio  
William W. Upham, '23; February 21, 1993; St. Petersburg Beach, Fla.  
Alfred C. Whiting, '23; January 8, 1993  
Gardner B. MacPherson, '24; January 26, 1993; Castine, Maine  
Louis Long, Jr., '25; November 22, 1992; Boston, Mass.  
G. Monroe Patch, '25; January 1, 1993; Richardson, Tex.  
Julio F. Arena, '26; January 7, 1979; Nicolas San Juan, Mexico  
Dudley L. Parsons, '26; January 12, 1993; Tucson, Ariz.  
John W. Searles, '26, SM '28; January 17, 1993; Plymouth, Mass.  
Theodore E. Casselman, Jr., '27; February 20, 1993; New London, N.H.  
E. Robert deLuccia, '27; December 17, 1992; Lake Oswego, Ore.

Warren A. Greenlaw, '28; January 5, 1993; Marblehead, Mass.  
Willis F. Tibbetts, '28; March 8, 1993; Reading, Mass.  
William H. Lerner, '29; January 17, 1993; Elyria, Ohio  
William J. Wiley, '29; December 18, 1990; Davis, Calif.  
Harold J. Brown, '30; January 21, 1993; Cupertino, Calif.  
Robert S. Cook, '30; January 12, 1993; Orange, Va.  
William B. Lodge, '30, SM '31; January 5, 1993; Hastings On Hudson, N.Y.  
William Metcalf, '31, SM '31; March 11, 1993; New York, N.Y.  
Thomas T. Amirian, '32; January 18, 1993; Brookline, Mass.  
Minot R.S. Bridgman, '32; November 9, 1992; White Plains, N.Y.  
Leon J. Cohen, '32; September 16, 1992; Pompano Beach, Fla.  
Charles E. Cullison, '33; January 19, 1993; Cambridge, Mass.  
Charles R. Watts, SM '33; January 11, 1992; Kensington, Md.  
James M. Farrin, Jr., SM '34; December 22, 1992; North Palm Beach, Fla.  
Arthur Gardner Fox, '34, SM '34; November 24, 1992; Little Silver, N.J.  
Harry W. Ruane, '35; January 22, 1993  
Marshall Sylvester Carter, SM '36; February 18, 1993; Colorado Springs, Colo.  
Karl A. Gelpke, '36, SM '37; January 28, 1993; Tiverton, R.I.  
Philip S. Major, '36; October 27, 1989; Slidell, La.  
William H.D. Shewbridge, '36; February 10, 1993; Cheshire, Conn.  
Alanson W. Chandler, '37; January 19, 1993; Tulsa, Okla.  
Davis Hamerstrom, '37; January 28, 1993; Roscoe, N.Y.  
George C. Moustakis, '37; February 6, 1993; Danvers, Mass.  
William F. Burrall, '38; February 11, 1993; Whittier, Calif.  
Paul B. Foss, '38; January 24, 1993; Provincetown, Mass.  
Sylvan G. Glick, '38, SM '39; January 20, 1993; Denver, Colo.  
Raymond E. Strickland, Jr., '38; January 23, 1993; Birmingham, Ala.  
John G. Wheale, '38; September 14, 1992; Cheshire, Conn.

## PUGH-ROBERTS ASSOCIATES

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Carl A. Segerstrom, Jr., '39; March 10, 1993; Winchester, Mass.  
 Gereld L. Tawney, ScD '39; December 22, 1992; Santa Barbara, Calif.  
 George J. Thomas, '39; February 16, 1993; New Bedford, Mass.  
 Joseph F. Libsch, '40, SM '40, ScD '41; January 4, 1993; Bethlehem, Pa.  
 Adolph L. Sebell, '40; February 1, 1993; Fayetteville, N.Y.  
 Leslie A. Sutton, '40; February 8, 1993  
 William R. White, '40; July 24, 1992  
 Irving J. Foote, '41; December 18, 1992; Berea, Ohio  
 Irving Stein, '41; January 19, 1993; Arlington, Mass.  
 Guillermo G. Arce, '42; October 9, 1992; Jalisco, Mexico  
 Donald P. Grotorex, '42; December 25, 1992; Tequesta, Fla.  
 William A. Rote, '42; January 13, 1993; Sarasota, Fla.  
 Ovide V. Fortier, Jr., '43; February 5, 1993; Falmouth, Mass.  
 Theodore Gunlock, '43; August 7, 1990; Encino, Calif.  
 Earl J. Mathewson, Jr., '43; December 31, 1992; Lincoln, R.I.  
 Edward H. McLaughlin, Jr., '43; November 19, 1992; Los Angeles, Calif.  
 James S. Ruoff, '44, SM '48; January 12, 1993; Rochester, N.Y.  
 Andrew J. Schmitz, Jr., '44; November 21, 1992; Huntington, N.Y.  
 Raymond D. Brown, Jr., '46; December 29, 1992; Scarsdale, N.Y.  
 Wasudeo S. Rajadhyaksha, SM '46; August 10, 1989; Bombay, India  
 Donald E. Boynton, SM '47; ScD '49; December 23, 1992; Kennett Square, Pa.  
 Joseph C. Hobaica, '47; February 23, 1993; North Easton, Mass.  
 William L. Starnes, SM '47; February 3, 1993; San Antonio, Tex.  
 William R. Chalker, SM '48, MET '49; April 9, 1992; Ocean City, N.J.  
 Nilo A. Lindgren, '48; December 24, 1992  
 Earl K. Solenberger, '48; January 24, 1993; Petersburg, Va.  
 Irving Steinhart, '48; September 26, 1992; Miami, Fla.  
 Frank P. Omohundro, NE '49; February 6, 1993; Ponte Vedra Beach, Fla.  
 Rush Taggart, '49; January 11, 1993; Stock-

bridge, Mass.  
 Harold E. Williamson, SM '49; February 12, 1993; Truckee, Calif.  
 Clarence F. Picard, '50; May 28, 1992; Capitola, Calif.  
 Lee S. Brodsky, '51; September 2, 1992  
 Gilbert G. Clarke, '51; December 8, 1991; Gladwyne, Pa.  
 Seldon B. Spangler, Jr., '51, SM '52; February 12, 1993; Los Altos, Calif.  
 Robert M. Mix, SM '52; December 12, 1992; San Diego, Calif.  
 Raymond H. Morth, '52, SM '53; January 27, 1993; Sudbury, Mass.  
 Donald J. Spooner, SM '52; January 6, 1992; Honeoye Falls, N.Y.  
 Frederick H. Bowis, '54; February 21, 1993; Bethesda, Md.  
 Brian T. Hastings, SM '54; March 4, 1993; Boston, Mass.  
 William H. Ryer, '54; January 7, 1993; Winchester, Mass.  
 John C. Eddison, PhD '55; January 22, 1993; Lexington, Mass.  
 Arthur B. Hersberger, '56; September 25, 1992; Haverford, Pa.  
 Solomon J. Buchsbaum, PhD '57; March 8, 1993; Westfield, N.J.  
 Frank W. Burr, '57; May 4, 1992; Teaneck, N.J.  
 Roger W. Kapp, '58; August 1, 1992; New York, N.Y.  
 Richard A.P. Thoft, '58; February 20, 1993; Pittsburgh, Pa.  
 Hubertus J. Weinitschke, PhD '58; December 5, 1992; Erlangen, Germany  
 Daniel F. Cameron, SM '59; March 28, 1992; Edmonds, Wash.  
 Norman A. Fujiyoshi, '59; October 11, 1992; Braintree, Mass.  
 Granville H. Sewell, '59; PhD '66; December 24, 1992; Englewood, N.J.  
 Herb S. Holdsambeck, SM '60; October 5, 1992; Huntsville, Ala.  
 Peter Buttner, '61; SM '78; January 17, 1993; Brattleboro, Vt.  
 Stephen E. Amador, '62; October 22, 1992; Plymouth, Mich.  
 Richard M. Hacker, '62; September 13, 1992  
 Edward G. Kondas, '62; October 6, 1991; Cleveland, Ohio  
 John P. Morenski, '62; January 24, 1993; Lynnfield, Mass.  
 Kenneth H. Cutt, '65; October 5, 1992; Toronto, Canada  
 Bengt Ison Sjogren, '66; November 10, 1992; Stocksund, Sweden  
 Edwin F. Alder, '67; March 6, 1992; Indianapolis, Ind.  
 Robert K. Treichler, '67; October 17, 1991; Williamsburg, Va.  
 Sandra A. Skiba, '68; October 13, 1990; St. Louis, Mo.  
 Dana B. Pettengill, '71, SM '73; January 8, 1993; Palo Alto, Calif.  
 John K. Wooten III, '71; June 11, 1991; Los Alamos, N.M.  
 George T. Chiu, PhD '73; September 3, 1992; Wappingers Falls, N.Y.  
 George T. Richardson, '75; January 24, 1992; New Iberia, La.  
 Nicholas J. Penny, SM '87; June 23, 1992; Cape Town, South Africa  
 Faith VanNise, PhD '89; January 3, 1993; Roxbury, Mass.  
 Robert H. Graulich, '91; September 1, 1992; Canandaigua, N.Y.

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**CORRECTION:** Dimitri N. Kazarinoff, '85, was erroneously reported as deceased in the May/June issue. (See *Class of '85 Notes* this issue.) We regret the error.—Ed.

It has been a year since I reviewed the criteria used to select solutions for publication. Let me do so now.

As responses to problems arrive, they are simply put together in neat piles, with no regard to their date of arrival or postmark. When it is time for me to write the column in which solutions are to appear, I first weed out erroneous and illegible responses. For difficult problems, this may be enough; the most publishable solution becomes obvious. Usually, however, many responses still remain. I next try to select a solution that supplies an appropriate amount of detail and that includes a minimal number of characters that are hard to set in type. A particularly elegant solution is, of course, preferred as are contributions from correspondents whose solutions have not previously appeared. I also favor solutions that are neatly written, typed, or sent via e-mail, since these produce fewer typesetting errors.

## Problems

**JUL 1.** We begin with a well-known computer problem suggested by the late Robert High.

In your favorite programming language (C, Lisp, Apl, etc.) write a program that, when run, produces output that is an exact copy of its own source code. Calls to system functions to "echo" the source from a file are not in the spirit of the problem!

**JUL 2.** A "classic" from Gordon Rice.

While cleaning out my office for retirement, I came across my freshman physics text: *Introduction to Mechanics and Heat* (2nd edition, 1939), by N.H. Frank. On page 204 is the following gem:

A slender homogeneous rod of length 60 cm., resting on a perfectly smooth horizontal surface, is struck a blow at right angles to the length of the rod at one end of the rod. Find the distance through which the center of the rod moves while it makes one complete revolution.

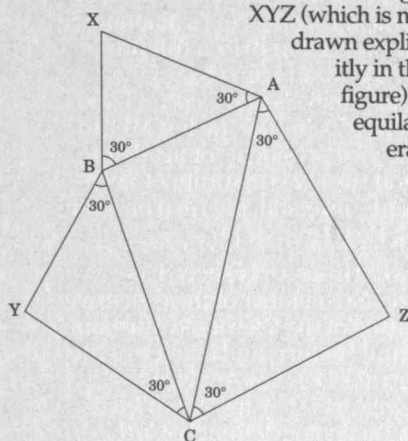


SEND PROBLEMS, SOLUTIONS, AND COMMENTS TO ALLAN J. GOTTLIEB, '67, THE COURANT INSTITUTE, NEW YORK UNIVERSITY, 251 MERCER ST., NEW YORK, N.Y. 10012, OR TO: GOTTLIEB@NYU.EDU



# Tell A Gram or Two

**JUL 3.** Consider an arbitrary triangle ABC, as shown in the figure below. From each of the vertices, extend two lines on the exterior of the triangle, each at a 30-degree angle from the sides. These lines intersect at the points X, Y, and Z opposite sides AB, BC, and CA. Show that triangle XYZ (which is not drawn explicitly in the figure) is equilateral.



## Speed Department

There are 10 jars of coins, each with an indeterminate number (large), but the jars all weigh the same. Nine of the jars have coins weighing one gram, one jar has coins weighing two grams. Using one weighing of an absolute scale (i.e., a scale that will weigh one object placed upon it and will tell the weight of that object as opposed to a scale that weighs two objects and simply identifies which one is heavier, which is normally used for these types of problems), determine which jar has the two-gram coins.

## Solutions

**F/M 1.** We begin with a Bridge problem from Jerry Grossman, who writes: Here's a cute bridge problem that you might want to consider for TR. It arose (well, except for one card that I changed to make it more interesting) in a Swiss team game last weekend at the Southeast Michigan Valentine's Sectional.

North	
♦ 4	
♦ A J 5	
♦ A K J 7 2	
♦ A 8 5 2	
West	
♦ 9 7 6 5	
♥ 5 3 2	
♦ 8	
♣ J 10 7 6 3	
South	
♦ A K Q J 10 8 2	
♥ 10 7	
♦ 6 5 3	
♣ Q	

The contract is six spades by South, East having bid hearts (overcalled North's diamond opening bid). How is the contract made against any lead? This is not a double dummy problem, so the play should make bridge sense.

I enjoyed the following solution from Frank Model, especially the ending:

Regardless of opening lead, win the first four tricks with the four aces ending in the South hand. (If a spade was led, get there by ruffing a club.) Now run trumps, pitching dummy's remaining clubs and hearts.

On the last spade, a diamond is pitched from dummy. East must guard diamonds (else dummy's diamonds run, making seven) and so is forced to pitch a heart honor. Now exit with the heart ten. East must win and lead into dummy's diamond tenace. A neat strip squeeze endplay.

Actually, all this makes reasonably good bridge sense. East is odds-on to hold all the key cards (diamond queen, heart king-queen) to justify his overcall. If so, the recommended line cannot fail. But would I have found it in the heat of battle? Almost certainly not.

East could also have overcalled on a club-heart two suiter, in which case a simple diamond finesse, after first cashing the diamond ace and drawing trumps, is a tempting alternative, albeit unsuccessful in this case. For this line, proper technique would entail ruffing some clubs to get a count. The fall of the club king would suggest this line is doomed.

Finally, I need to explain why I am submitting a solution at all, since I do not generally do so for "real life" bridge problems because I do not consider them puzzles. For me, this one has a definite MIT twist. In 1960, while a sophomore, I got involved in my first money bridge game. After staggering into a tenuous six no-trump contract (doubled and vulnerable!), I managed to make by executing—quite inadvertently—a strip squeeze endplay. Needless to say, I was quite pleased with myself (partner was ecstatic...) and looked forward to pulling off this bridge-maneuver-with-the-racy-name many more times as my bridge career progressed, but, during the intervening 33 years, the opportunity has never come up. Until now.

And, with that irrelevant anecdote, I bid you farewell.

**F/M 2.** Our next problem is Tom Hansen's first submission, a true-to-life story illustrating that "biology students should learn their physics."

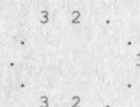
A scientist at a Boston-area biotech company needs to centrifuge 5 identical samples. He has available 3 centrifuges with capacities of 6, 8, and 12 samples. Can he use any of these centrifuges to prepare the 5 samples together, without adding another sample or making the centrifuge unbalanced?

The following solution is from Steven Weiss, who writes that this is "my first submission after enjoying your column ever since it began":

Since 5 samples cannot be placed at a uniform distance around any of the centrifuges because 5 fails to divide 6, 8, or 12, the solution must involve non-uniform distributions.

Breaking 5 up into 2 + 3, we will try to simultaneously balance each group. We cannot balance the group of 3 samples in the 8-centrifuge, but we can in the 6 or 12 by distributing them uniformly

at intervals of 120 degrees. Similarly we can distribute the group of 2 by placing them on opposite sides of the 6- or 12-centrifuge. The 6-centrifuge cannot hold both groups at once, however, but the 12-centrifuge can! Thus the 12-centrifuge gives us the only solution (as the only other way to break up 5 is 4+1 which patently fails). The balanced configuration looks like this:



Where the CG of the two samples labeled 2 is the center, and the CG of the three samples labeled 3 is the center. Therefore (by knowing some physics) the CG of all 5 is the center.

Bruce Dunwoody notes that any number of identical samples can be loaded into a 12-sample centrifuge except 1, and its complement 11. Dundee also reports that a Vancouver company makes a device that can centrifuge 1 sample; it spins the tube about its own longitudinal axis.

**F/M 3.** Walter Cluett asks one that sounds very familiar to me. Who knows but maybe it was in "Puzzle Corner" some 20-odd years ago.

Four bugs are standing on the corners of a square surface 1.414 feet on a side. Simultaneously, each starts walking at the same rate directly, and always directly, toward the bug on its right. Eventually they all meet. How far did each bug travel?

There seem to be two techniques. For one, you first show that each bug travels a logarithmic spiral and then do some analysis. The second "short form" solution is typified by the following submission from George Biehl, who writes that he'll "take a shot at the solution and probably prove why I'm now a full-time administrator":

A ↓                      ← B

1. Consider two of the bugs.
2. The velocity vector of bug A is always perpendicular to that of the bug B. (They stay on the vertices of a rotating, shrinking square.)
3. Thus the velocity of the bug A has no component of motion to increase or decrease the distance which B must travel.
4. Bug B must therefore travel 1.414 feet.

## Other Responders

Responses have also been received from K. Bernstein, G. Biehl, E. Biek, A. Biolchini, G. Blondin, D. Brahm, F. Carbin, T. DeFazio, S. Feldman, M. Fountain, D. Furman, C. Gabor, M. Garelick, D. Harris, R. Hess, W. Himmelberger, E. Kaplan, R. King, M. Lindenberg, B. Margulies, L. Nasser, A. Ornstein, D. Patter, K. Rosato, E. Sard, E. Sard, and K. Woods.

## Proposer's Solution to Speed Problem

Take one coin from the first jar, two from the second, etc., and place them all on the scale. This one total weight determines the jar. If the weight is 65, the jar is number 10; if 64, number 9; etc.



# MIT LIFE INCOME FUNDS

## PROFESSOR JOHN A. HRONES

HOME: Jaffrey, New Hampshire  
Sarasota, Florida

CAREER: After he earned an S.B. (1934) and S.M. (1936) in mechanical engineering, Professor Hrones took a job as an assistant to the factory manager of the Caldwell Engineering Company, Newburgh, New York. When he returned to MIT in 1939 to earn a doctorate, he stayed and joined the faculty, becoming head of Mechanical Engineering's Machine Design Division in 1946, a full professor in 1948, and director of the Dynamic Analysis and Control Laboratory in 1950. In 1957, he left MIT to become vice president for academic affairs at the Case Institute of Technology in Cleveland and then provost in 1964. He retired in 1977.

Professor Hrones has served as director and member of the executive committee of the Cleveland Museum of Natural History, and trustee of the Institute for Defense Analyses (Washington, D.C.), the Asian Institute of Technology (Bangkok), the Ohio Research and Development Foundation, and the Cleveland Skating Club (while a student, Professor Hrones was captain of the MIT hockey team). He has been a member of the U.S. Department of Commerce Panel on Science and Technology and the advisory committee of the Ford Foundation Residency Program in Engineering.

GIFT OF CAPITAL: John A. Hrones and Margaret B. Hrones Fund in the Maclaurin Pooled Income Fund.

QUOTE: "I feel that everything I have accomplished is due in large part to MIT's influence on me, both as a student and a faculty member. My wife Margaret was also very active in MIT affairs. The Maclaurin Fund made it possible for us to give in return more than we could have otherwise."

For more information about gifts of capital, write or call D. Hugh Darden, W. Kevin Larkin or Frank H. McGrory at MIT, 77 Massachusetts Avenue, Room 4-234, Cambridge, Massachusetts 02139-4307; (617) 253-3827.

Photo: Richard Howard

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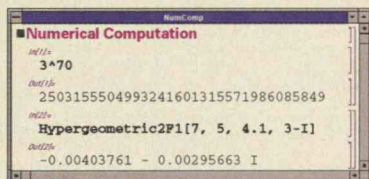
**"The importance of the program cannot be overlooked"**

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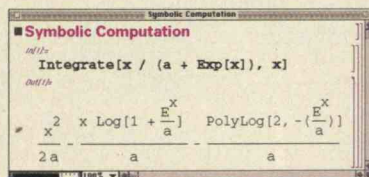
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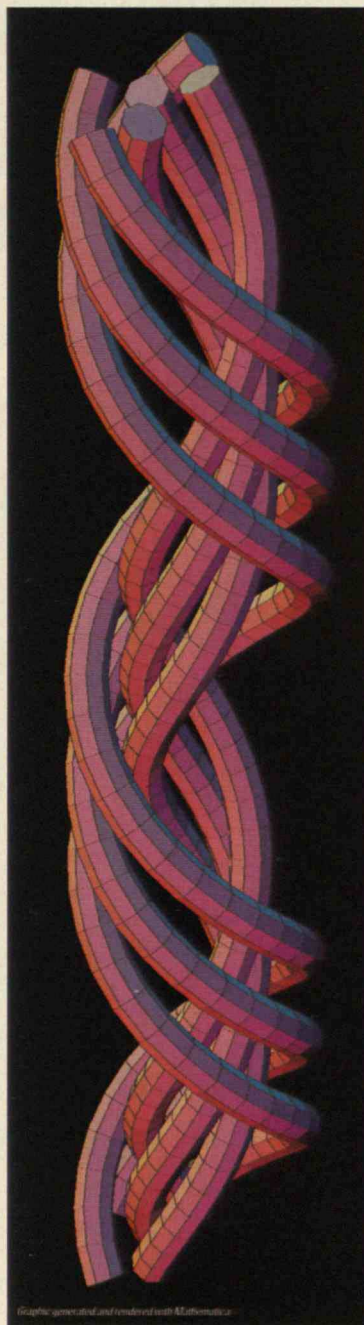


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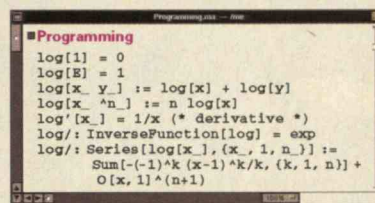


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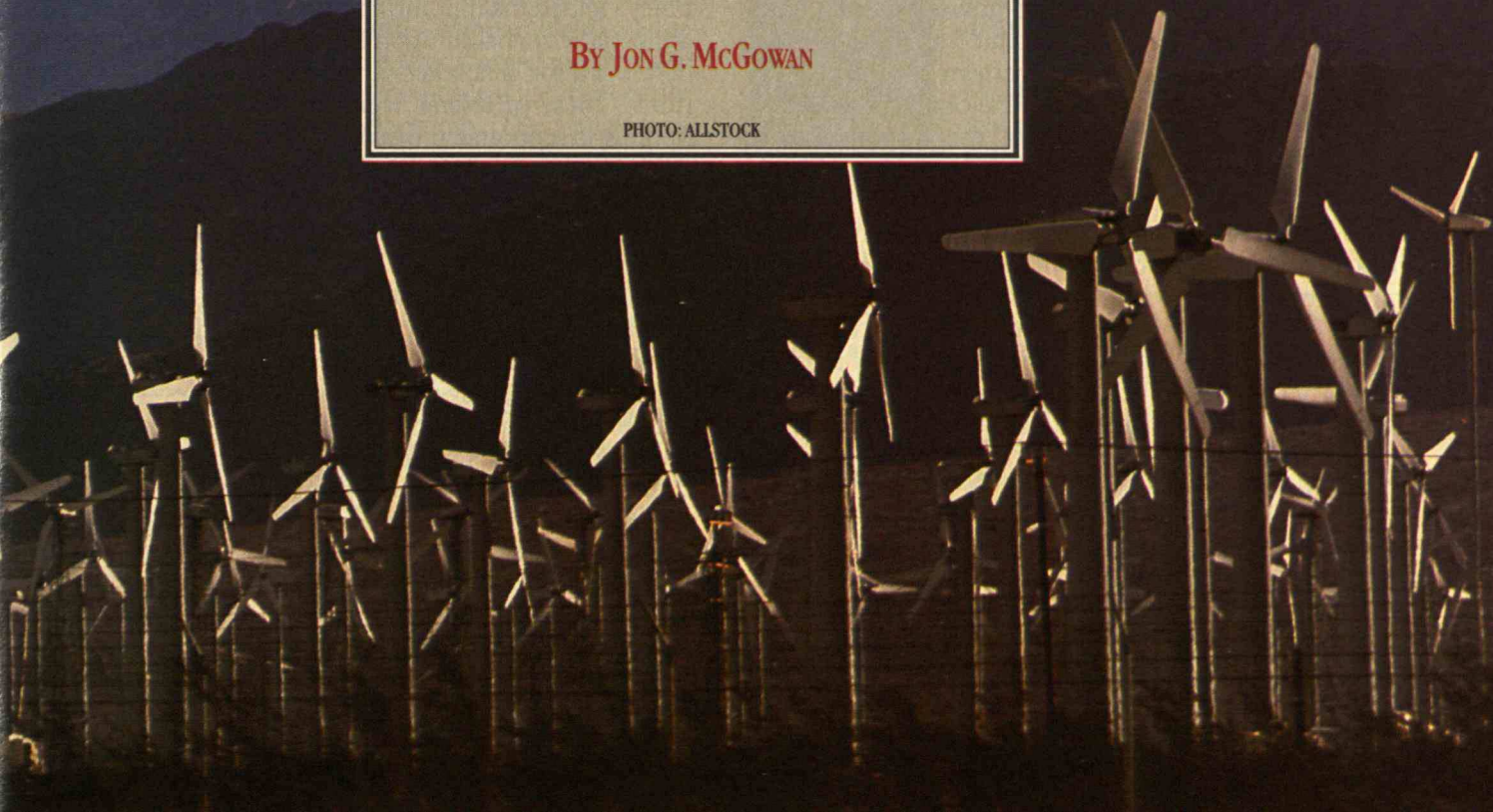
# TILTING TOWARD WINDMILLS

*Long seen as a quixotic  
energy source, wind power is  
making a comeback, shattering  
myths in the process.*



BY JON G. MCGOWAN

PHOTO: ALLSTOCK







**E**MERGING from the shadow of an energy crisis in the 1970s, a wind-power industry flourished briefly in the United States. Part of an ambitious U.S. government program to support research and development on renewable energy sources, the Department of Energy (DOE) and the National Aeronautic and Space Agency (NASA) sponsored the construction of a wide variety of large wind turbines—most accompanied by exaggerated claims from promoters. Many believed this program would provide the spark for a global enterprise featuring a pollution-free, renewable source of energy. But by the early 1980s, with the exception of the California wind farms, U.S. interest in wind energy as a large-scale source of electricity almost disappeared.

What happened?

World oil prices dropped and the Reagan administration dramatically curtailed funding for renewable-

energy research. Also, the initial work on large wind turbines yielded disappointing results—their design was almost always based upon ill-suited engineering codes developed for helicopters and other aerospace applications. These problems were compounded by overly optimistic economic projections, siting snags, and difficulties connecting wind-generated electricity to utility power grids. Because progress was stymied so early, the results gathered from the early wind projects never reflected the energy source's full potential. Wind power's kinks had yet to be worked out.

Even a separate effort in California in the 1980s—to develop wind farms employing large groups of smaller, mass-produced, easy-to-install wind turbines—brought bad reviews. Often hastily erected as tax shelters to take advantage of federal and state tax credits, the earliest California wind farms were plagued by poor engineering design, leading to several cases of structural failure. Thus a significant market for small, backyard wind turbines never developed.

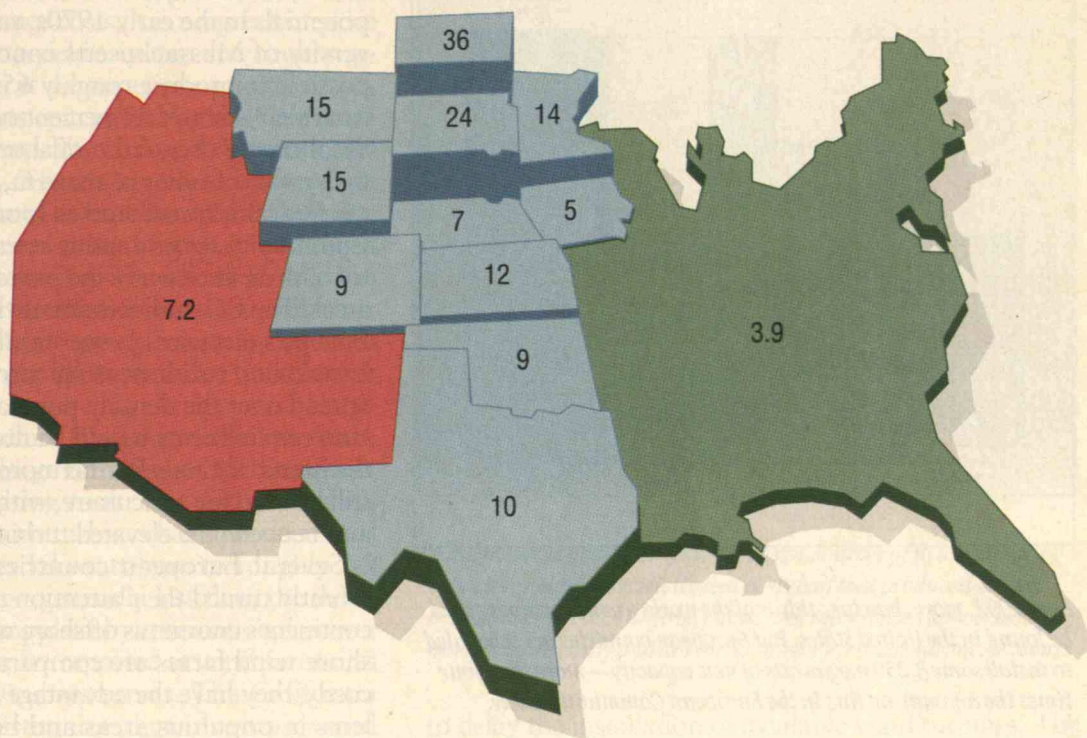
Despite initial problems, California's largest wind-farm developers and operators actively tried to improve their wind-turbine systems, and their persistence paid

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*JON G. MCGOWAN is a professor of mechanical engineering and co-director of the Renewable Energy Research Laboratory at the University of Massachusetts at Amherst. He has studied, designed, and participated in the siting of wind-turbine installations for the past two decades.*



## WIND RESOURCE IN THE UNITED STATES



*Like prototype race cars, large-scale, vertical-axis wind turbines (photo above) never managed to economically capture the vast U.S. wind resource. Today's wind farms are poised to do better. The numbers on the map represent the percentage of 1990 electricity demand in the continental U.S. that each state or region could theoretically meet using today's wind technology. North Dakota alone, for example, could supply 36 percent of the electricity needs of the lower 48 states.*

off. Today the California wind farms have a capacity of 1,500 megawatts—comparable to a large nuclear power plant—and produce about 1.5 percent of the entire state's electricity. Their peak production approaches 8 percent of the electricity generated by the major California utility that buys their power. All told, the state's three wind farms generate enough power to meet the residential needs of a city as large as San Francisco.

Nevertheless, the U.S. public's view of wind power remains distorted by its early failures. But technological progress over the past decade is prompting resurgent interest in wind energy, laying to rest lingering misconceptions that have hampered the technology's acceptance as a reliable and important source of electricity.



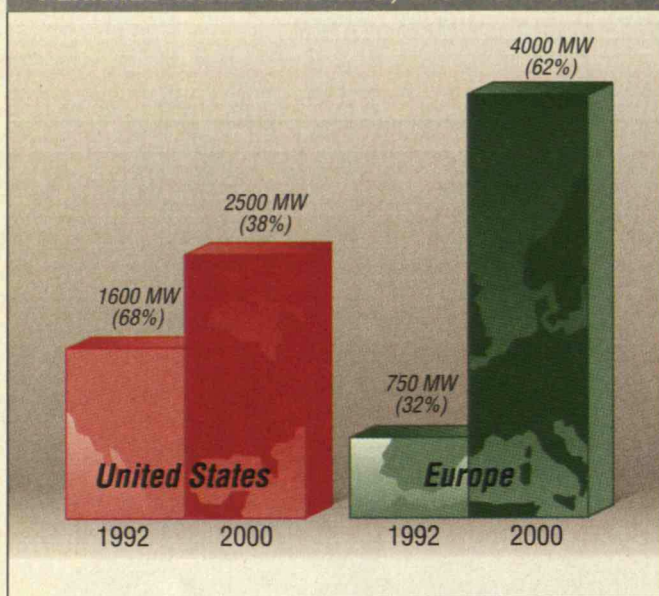
### WIND POWER IS NOT A SIGNIFICANT ENERGY RESOURCE.

Most people find it hard to imagine that a steady breeze could ever provide enough power to generate significant amounts of electricity, at least compared with a large nuclear power plant or other massive generating station. To be sure, wind power is dispersed, but a huge wind resource is there to be captured.

According to recent studies of wind energy feasibility, some 14 states—especially those in the nation's midsection, from Texas to North Dakota—possess a wind resource at least as great as that found in California. In fact, if wind farms were built today on all the available sites in North Dakota, that state alone could supply more than a third of all the electricity consumed in the continental United States. (Such an assessment assumes that land used for urban and residential areas, parks, and wetlands as well as a substantial fraction of forest and agricultural lands are exempt from consideration.) A study by the Battelle Pacific Northwest Laboratory



## PLANNED WIND TURBINES, U.S. VS. EUROPE



*As of 1992, more than two-thirds of the world's wind turbines could be found in the United States. But European countries are scheduled to install some 3,250 megawatts of new capacity—more than four times the amount on line in the European Community today.*

estimates that today's turbine technology could supply 20 percent of the country's electrical needs, even if the wind resource were exploited only in locations ranked class 5 or higher—where wind speed averages at least 16 mph at a height of 30 meters. If class 3 areas could be economically developed (where the average wind speed is 14 mph at a height of 50 meters), approximately 13 percent of the contiguous U.S. land area could be eligible for wind turbines—enough to supply roughly four times the nation's current electricity consumption.

Even more helpful, though, are examples of wind power's local potential. A recent study supported by Minnesota's energy commission determined that the wind resource at just one of the state's southwestern ridges could supply almost all of Minnesota's electricity.

It is little wonder, then, that the Electric Power Research Institute (EPRI) reports that numerous electric utilities have begun to launch wind-farm projects within the past year. For example, Niagara Mohawk, a New York utility strongly committed to nuclear power just a decade ago, has joined a consortium developing the next generation of wind machines and has already installed New York State's first utility-scale wind turbines near Lake Ontario, replete with advertisements

dubbing them the "Niagara Mohawk Air Force."

Even populous regions—in the northeastern United States, for example—need not write off wind power's potential. In the early 1970s, researchers from the University of Massachusetts concluded that it would be possible to produce roughly 650 billion kilowatt-hours each year—about 22 percent of today's total U.S. electrical energy use—from offshore wind systems. Like so many wind studies of that era, the results were largely ignored. But recent studies sponsored by the European Community are prompting researchers and utilities alike to think again about wind power's potential in crowded areas. The EC studies estimate that at least 10 percent of Europe's electrical power could be supplied by land-based wind turbines using current turbine technology. Spread over the densely populated continent, the total land requirements would be no greater than the size of the island of Crete. Furthermore, most of this land could still be used for agriculture, with crops growing beneath and between the elevated turbines.

Several European countries and developers have recently turned their attention as well to exploiting the continent's enormous offshore wind resource. While offshore wind farms are comparatively inaccessible and costly, they have the advantage of avoiding siting problems in populous areas and benefiting from average wind speeds that are higher than those found among their land-based counterparts. Two prototype offshore turbine installations now operating are designed to investigate the problems encountered in constructing and operating wind farms in a hostile ocean environment. One system, two kilometers off the coast of Denmark in water depths varying from 2.5 to 5 meters, features nearly a dozen 450-kilowatt turbines.



## WIND-GENERATED ELECTRICITY IS EXPENSIVE AND UNRELIABLE.

The persistent misperception that wind power is too costly results largely from early NASA/DOE research focusing on turbines that featured vast blade diameters, stood hundreds of feet tall, and were rated in megawatt sizes. For example, the NASA/DOE program produced four series of machines ranging from a 0.1-megawatt model with a blade diameter of 38 meters to a 3.2-megawatt model with a blade diameter of 98 meters. In many respects, these machines were technical successes, but they were akin to high-speed, prototype race cars: they were not designed for ease of production or maintenance and they were enormously



expensive. Because the major factors influencing the delivered cost of wind power are the cost of the turbine and supporting systems (including land), as well as operating and maintenance costs, it is no great surprise that the program failed to yield a system that could supply electricity to utilities at a competitive price.

Yet the modern efforts epitomized by the California wind farms have dramatically changed the economic picture for wind energy. These systems, like other such installations in Hawaii and several European countries, have achieved economies of scale through standardized manufacturing and purchasing. The efforts have led to a dramatic drop in the installed cost of new wind turbines from roughly \$4,000 per kilowatt in 1980 to approximately \$1,000 per kilowatt today (in constant dollars).

Improvements in machine design and efficient maintenance programs for large numbers of turbines have similarly reduced operating costs. The cost of electricity delivered by wind-farm turbines has thus decreased from about 30 cents per kilowatt-hour to roughly 7-9 cents per kilowatt-hour—generally less than the delivered cost of electricity supplied by conventional power plants. Even lower costs are reported at wind-farm sites with above-average wind resources. The California Energy Commission estimates that investor-owned wind-power plants now generate electricity at a rate ranging from 4.7 to 7.2 cents per kilowatt-hour.

According to recent studies by the National Renewable Energy Laboratory as well as by EPRI, numerous U.S. wind-farm sites can now be expected to deliver electricity at a cost of roughly 5 cents per kilowatt-hour, ranking wind as one of the least costly sources of new electric power in many locations. And the benefits of full-scale mass production have yet to be reached; capital costs are likely to fall further as the industry develops. Meanwhile, the reliability of wind turbines has shown similar dramatic improvement. Recently installed turbines are available to generate electricity over 95 percent of the time, compared with roughly 60 percent in the early 1980s.

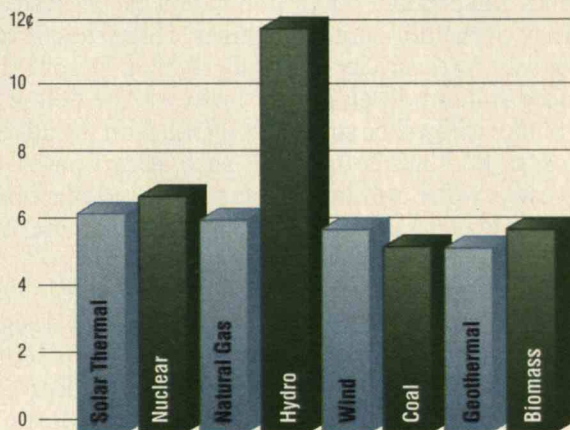


### NEW AND IMPROVED MACHINE DESIGNS ARE NEEDED TO MAKE WIND POWER FEASIBLE.

Despite the above-mentioned progress, many people believe that the future of wind energy will depend on the development of improved turbines that will look very different from today's designs. Until recently, that argument was used

## COST OF NEW ELECTRICITY GENERATION

Cents per kWh in constant 1987 \$



Source: CEC: 1990 ETSR

*Wind power is one of the least expensive sources of new generating capacity, yielding electricity that costs half that produced by new hydropower plants. Oil-fired plants, not represented above, would be even more costly and are rarely sought for baseload power today.*

to delay the installation of available wind turbines. The fact is, however, that today's state-of-the-art wind turbines are already highly efficient. They will surely improve incrementally over time, benefiting from new materials and other innovations. But, like the bicycle, today's wind turbines represent a simplicity of design that is already well developed and likely to last for a long time.

Today's conventional utility-scale wind machines have propeller-like blades that rotate on a horizontal axis, perpendicular to the wind stream. The number of blades may vary (usually two or three), as can the position of the rotor (upwind or downwind), but despite numerous other designs proposed or built by wind turbine inventors or developers, the propeller-blade design has emerged as the predominant type in the more than 20,000 utility-scale wind turbines now in operation worldwide.

As emphasized in a 1991 study by the National Academy of Sciences, this configuration is based on detailed analytical and computational models as well as an extensive experimental database. Stresses and materials have been studied in great depth, as have the effects of wind shear and turbulence. And the technology has been tested in the field for more than a decade, providing billions of kilowatt-hours of electricity to consumers.

Today's utility-scale turbines, like the gas-driven tur-



bines that power jet airplanes, represent a sophisticated piece of rotating machinery. There is no reason to believe that other configurations such as vertical-axis machines will produce major improvements because the efficiency of the horizontal machines' ability to convert wind power to electricity is already so high. Despite this advanced state of development, however, the design of rotor blades can still be streamlined and, with the advent of stronger and lighter materials such as carbon-based composites, taller and larger-diameter wind machines (which could generate more electricity per machine) can surely be developed.

Advances in power electronics, especially the widespread incorporation of a variable-speed design, could also boost efficiency. This innovation, currently under development in the United States and Europe, uses state-of-the-art electronics to generate a constant-frequency AC power despite varying wind (and turbine rotor) speed. If the designs prove as commercially successful as expected, they will increase energy productivity (and hence lower energy-production costs) by allowing turbines to usefully capture electricity at lower and fast-changing wind speeds.



MYTH # 4

**THE TECHNOLOGY IS IMPRACTICAL FOR USE BY UTILITIES BECAUSE OF PROBLEMS CONNECTING WIND MACHINES TO THE ELECTRICITY GRID, AND BECAUSE WIND ITSELF IS INTERMITTENT.**

There is nothing about the hardware required to connect wind turbines with the utility grid that differs markedly from that used by conventional power plants. Early prototype wind farms did have some transmission and interface problems. The power generated by the individual turbines was sometimes difficult to synchronize, causing difficulty in tightly controlling the current delivered to the grid. But advances in power electronics and wind-turbine control systems have virtually eliminated these problems.

Variability of its power sources can be a problem for a utility, however, and wind power is a variable source of electricity. But this just means that utilities must incorporate this feature of wind energy into their planning. Utilities deal with short-term variations in power input (over seconds to minutes) the same way they deal with short-term variations in energy demand: by exploiting the ability of the electricity grid itself to absorb some fluctuation in the amount of current it carries at any given moment. Supply and demand can never be matched perfectly; the key for a utility is simply to

make sure enough current is flowing so that the next application can be met.

Numerous industry studies have also shown that the short-term power output of a wind farm varies significantly less than that of a single turbine, so if anything the problem has diminished. Still, the effect on an electric utility of all variations in the output of a wind farm depends on the so-called penetration level of wind-generated electricity on the grid. Today, wind energy generally has a small effect on utility operations because it normally represents only a tiny fraction of the total electric capacity of the utility. Thus, medium-term fluctuations (over minutes to hours) can be addressed simply by adjusting the amount of electricity produced by other sources.

In an important assessment, England's Central Electricity Generating Board concluded recently that as much as 20 percent of the country's electricity could be produced from wind power without major modifications to the present grid. At penetration levels much above 20 percent, however, it is widely believed that wind-generated electricity would lose some of its economic benefits. Energy storage systems like batteries or pumped hydro would likely be required to buffer the variability of the energy source.

To provide electricity when the utility needs it, utility planners must determine how much of a generating plant's theoretical capacity it can reliably be expected to provide (whatever the source). Here again, wind power presents few problems that differ substantially from other sources of electricity. Wind farms' so-called capacity factor can be determined by the predictability of the winds at the site, then correlated with the utility's needs.

### To Compete with Europe

The reality is that wind-produced electricity is now less expensive than electricity produced by conventional fossil- or nuclear-powered generating plants in many parts of the world. And unlike some of the proposed renewable electric-power sources like photovoltaics, wind power's future is not dependent on further breakthroughs in engineering or materials technology. What's more, many energy experts argue that energy sources like wind power should be given credit for avoiding the added costs to society—such as the price of controlling air pollution, managing nuclear waste, or avoiding global warming—associated with conventional electrical-energy production.

On the other hand, the siting requirements of wind farms have caused numerous regulatory and public interest groups to take a hard look at their adverse envi-

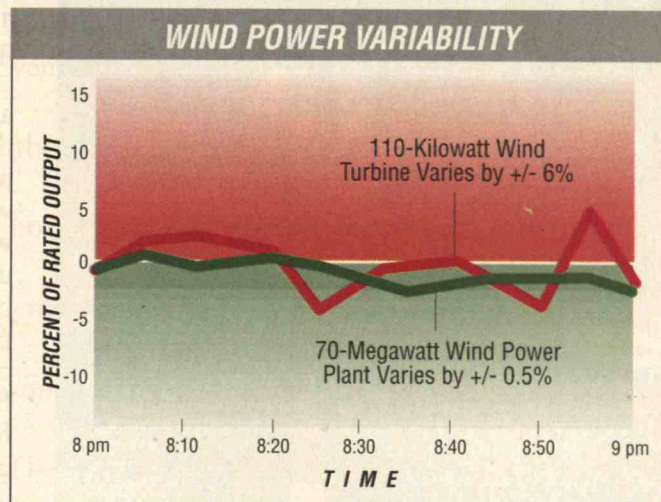


ronmental effects. U.S. and European studies have identified a host of potential problems, ranging from telecommunications interference to impacts on wildlife and natural habitats. However, when these effects are balanced against those associated with other forms of electricity generation, it is clear there are no major barriers to large-scale implementation of wind power.

While wind power has been comparatively ignored in the United States—in no small part because of the persistent myths discussed above—the center of gravity of the wind industry and expertise has shifted from the United States to Europe over the past few years. For proof, one has only to compare the attendance or technical content of a U.S. vs. European wind-energy conference, look at the national source of utility-scale wind turbines, or note the level of wind-farm development in many areas of Europe. The interest and enthusiasm for wind power in Europe is much higher—not surprising in light of the fact that the European Community is presently spending about 10 times more for wind-energy R&D than the U.S. government.

During the 1980s, progress in European wind energy proceeded at a steady pace, with increasing commitments from several countries for R&D and market incentives. As a result of this European Community program, member nations have over 25 wind-turbine manufacturers offering utility-scale wind machines. For the past two years, European wind installations have exceeded those in the United States. And according to the American Wind Energy Association, Denmark, England, Spain, and the Netherlands will each surpass the United States in new installations of wind-turbine capacity during the rest of the decade. The goal of the European Community is to install more than 3,000 megawatts of new wind energy by the year 2000, and there is every indication that this goal will be met or exceeded. Meanwhile, U.S. utilities expect to add a total of roughly 900 megawatts of new wind energy over the same time period.

In many ways, the European experience is instructive for U.S. energy planners. The market stimulation carried out by the European countries, acting cooperatively through subsidies, production incentives, and tax credits, has contributed to the growth of wind-energy development. Even though the huge wind resource in many parts of the United States is now well documented, and small, independent power producers have shown interest in using wind to contribute to the nation's electricity grid, it is clear that the widespread development of wind energy cannot succeed piecemeal. Farsighted energy policies are first needed to help guide the efforts of utilities, various zoning authorities, and state and federal agencies.



*The output of individual wind turbines fluctuates significantly. Groups or "farms" tend to smooth out such variations.*





*Much of our knowledge—and many lingering myths—about generating electricity from wind derive from experience with large turbines like these, sponsored by the U.S. Energy Department and NASA in the 1970s and 1980s.*

On the federal level, the U.S. government should institute a production incentive for wind-generated electricity to help develop the industry. Such an incentive could take the form of a tax credit to developers or utilities for every kilowatt of new, renewable-energy generating capacity they build. At the state level, regulatory reforms are needed to overcome lingering barriers to renewable energy: utilities must be encouraged to incorporate the external costs of power generation (such as pollution) into their decision making and pricing. Meanwhile, states can offer tax incentives and other support to small manufacturers of wind-energy components to help remove the biases in the energy industry that favor nonrenewable sources and large manufacturers.

Developers of wind turbines need to continue to improve the cost-effectiveness of new machines, and engineers will require tools such as computer-aided design to better understand machine fatigue and incorporate the use of new, lighter, and stronger carbon-based composite materials. Because some of this work is likely to be beyond the capability of small firms, government support will be essential. Such support could also provide a powerful stimulus to diverse industries. For example, it could open a gold mine of opportunity for a wide range of engineering disciplines, including mechanical, materials, aeronautical, electrical, and civil, with consequent payoffs not confined to wind power alone.

Although countries in Europe and elsewhere around the world have already begun to awaken to the potential of wind power, the United States is fortunate to have one of the world's largest resources of wind energy. And the world's major supplier of wind turbines and developer of wind farms continues to be a California-based firm called U.S. Windpower, currently operating more than 4,200 wind turbines and involved in manufacturing and developing wind farms at a number of European sites. But one firm cannot provide an industrial base for a growing field. With a coordinated effort, guided by an enlightened government energy policy, it is not too late for the United States to resume its role as the world's largest developer of this resource, and to regain a leading role in wind-energy technology and manufacturing. ■





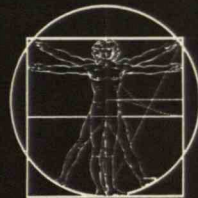
BY DONALD A. NORMAN

# *Toward Human-Centered Design*

C O N S I D E R

the free throw in basketball. A player stands a fixed distance from the hoop and is given one or two chances to toss the ball through it, unimpeded by the other players. ❖

What is it about the free throw that is hard for the player? Throwing the ball with the required accuracy. Becoming good at the free throw requires continual practice and concentration. Amateurs will miss frequently. Even professionals will occasionally miss. What is easy about the free throw? Many things, including seeing the hoop: it would never occur to anyone to spend time practicing seeing the hoop. ❖ If a machine were to attempt the same task, what would be hard? Seeing the hoop. What would be easy for the



TECHNOLOGIES HAVE  
TRADITIONALLY  
FORCED PEOPLE TO  
CONFORM TO THE  
NEEDS OF MACHINES.  
BUT IN THIS ERA OF  
ADVANCED INFORMATION  
PROCESSING,  
THE POWER OF THE  
MACHINE CAN  
READILY BE  
TAILORED TO THE  
NEEDS OF  
THE USER.





machine? Throwing the ball. If the machine could distinguish the hoop from other objects, tossing the ball into it would be trivial, a simple matter of computing the appropriate trajectory and applying the required forces. The mathematics would be easy, the perception would be hard.

Now consider a second situation. Helene is showing slides but the projector beam is too low. She looks at the corner of the room and says to her friend, "Over there." Her friend goes to the table in the corner of the room, gets a book, and brings it to Helene, who puts it under the front of the projector and proceeds with the slide show.

What is easy for the person? Realizing the nature of the problem, finding an unconventional use of an existing object, asking someone to help. The friend found it easy to understand what was needed, and fetching the book was simple—so simple that normally we wouldn't even talk about it.

What would be hard for a machine, even an intelligent robot? First of all, noticing the problem and having some empathy for Helene and her situation. Empathy is a hard trait to build into machines, even the most artificially intelligent of them. And, if the robot were acting as Helene's assistant, there is no way that the look followed by the words "over there" would be understood. Where is the verb? What is the command? Suppose the command were precise: "Please go over to the red book with the three glasses of wine on it that is lying on its side on the small wooden table in the southeast corner of the room. Bring the book here and give it to me." Then what? The hard part for the robot would be moving to the proper table without knocking something over along the way, managing to pick up the book properly (after dealing with the three glasses of wine), and so on.

But there is an easy solution for a robot, if it ever managed to understand the problem with the slide projector. It could just lift the appropriate side to the proper height and hold the projector for the next





hour or two during the show. It would be hard to imagine a person doing that.

The things people are good at are the things natural to humankind: Creativity. Invention. Adapting to changing circumstances. Thinking of the problem in the first place. Perceiving the world. Feeling emotions such as joy, love, hope, and excitement. Enjoying humor and experiencing wonder.

Every one of these and similar things is hard for a machine. We are capable of building machines that can perform flawlessly many of the things we are bad at but it is very difficult to build machines that can do the things we are good at.

"Why, that's wonderful," you should be saying. "Between us and our machines, we could accomplish anything. People are good at the creative side and at interpreting ambiguous situations. Machines are good at precise and reliable operation."

Unfortunately, this is not the approach engineers have followed in reacting to advances in technology. Instead, they've adopted a machine-centered view of life: machines have certain needs, humans are adaptable. Give the machines priority, technologists' thinking goes, and tailor human operations to fulfill the requirements of machines.

It's not that technologists don't care about people. They do—after all, they are people, too. But they also focus predominantly on the issue of machine performance. When there is an industrial accident, review teams pore over the site, looking for signs of equipment failure. If none is found, humans are blamed. Thus, in 75 percent of commercial aviation accidents, pilots are supposedly at fault—"human error." People, as we know, are distractible and imprecise. They make errors in remembering things, in doing actions they shouldn't have done, or in failing to do things they should have. As soon as we take the machine point of view, everything automatically leads to a focus upon human weaknesses rather than strengths.

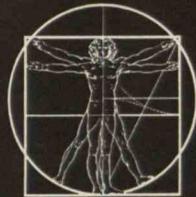
## To Automate or Informate?

Airplanes today are flown more and more by automated controls. But did the designers do a careful analysis of the cockpit to decide which tasks were best done by people and which were in need of some machine assistance? Of course not. Instead, the parts

that could be automated *were* unautomated, and the leftovers given to the humans. Earl Wiener has studied the use of automation for NASA's aviation safety program in the most advanced, so-called "glass cockpits" (the name derives from the fact that so many of the old-fashioned mechanical instruments have been replaced by "glass" display screens).

Wiener finds that automation works best when conditions are normal. When conditions become difficult—say an engine, a radio, or an electrical generator fails—the automation is also more likely to fail. In other words, automation isn't available to help when it is needed most. When an automated system suddenly stops working, often with no advance warning, the crew is thrust into the middle of the problem and required to immediately figure out what has gone wrong and what should be done. There is not always enough time.

The same type of machine-centered approach causes problems in manufacturing. Back when people walked the production lines, they could tell what was happening by the sounds, the vibrations, even the smells. When computers took over, the machines had to be located in air-conditioned, air-filtered rooms, away from the heat, noise, and vibration of the factory. The people who tended the production lines were relocated to be with the automation controls, thus changing the way they interacted with the operation. Whereas before they were physically able to keep an eye on things, often catching problems before they arose, now they are connected to the real world by second- or third-order representations: graphs, trend lines, flashing lights. The problem is that the representations people



THE BEST  
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receive are most often those used by the machines themselves: numbers. But while the machines may use numbers internally, human operators should receive information in the format most appropriate to the task they must perform.

In her influential book, *The Age of the Smart Machine*, Shoshana Zuboff distinguishes between systems that automate and those that “informate”—systems that provide people with access to a rich variety of information that would not be otherwise available. In an informed system, technology is used to inform, not to take over. Workers are encouraged to make use of on-line databases and real-time measurements of critical variables to get immediate answers to questions about any aspect of the task.

In an automated system, workers are relegated to the role of meter watchers, staring at automatic displays, waiting for an alarm bell that calls them to action. In an informed system, people are always active, analyzing patterns, continually able to find out the state of whatever aspect of the job is relevant at the moment. This involvement empowers the worker not only to become more interested in the job, but also to make more intelligent decisions. When the equipment fails in an informed system, workers are much more knowledgeable about the source of the problems and about possible remedies.

### Humane Communications

Consider television or radio channels, which are organized by channel number or frequency, not by content. This organization is convenient for the broadcasters and the newspaper listings but it does not always serve the consumer's purposes very well.

In my hometown, the newspaper lists 48 television channels: the shows for one evening (from 6 p.m. to midnight) occupy most of a page. You should watch *Nova*, someone says to me, but the TV guide doesn't make the task easy. If 6 hours of television list-

ings require almost a full newspaper page, an entire week of 24 hours and 7 days might take as much as 28 pages. Must I must search every channel for every day until I find the show? The last time I was in a strange city, I failed to find what I wanted. Among other problems, the same show is carried by differ-

ently numbered stations in different cities (or even by differently numbered stations in the same city if they have different cable services).

Today's organization of television channels is somewhat as if a bookstore were to organize its books by publisher instead of by topic, content, or author. Worse, as if the publishers were each given identification numbers instead of names, with each bookstore numbering the publishers differently.

And the problem may get even more unwieldy, with systems that offer 500 or more channels of information. But, on the other hand, we could combine the power of digital transmission with computer technology to produce a human-centered design, where shows can be selected by name, content, or actors. We could even point to a desired program and say, in effect, “show me that,” and have the program appear on the screen whenever it is most convenient for us.

The traditional telephone is another example of machine-centered technology. Its initial design did not allow a caller to follow the normal rules of social courtesy. Even today, after decades of adaptation, there is still no way the caller can know the activities of the recipient, no way to tell whether the person is busy, unwilling to be interrupted, or anxiously awaiting the call. Instead, the ringing telephone simply informs us that someone is on the line.

People have used add-ons such as phone machines and cordless extensions to address some of the telephone's shortcomings. But the technology is still designed around the needs of the system: the goal is to make proper connections as efficiently as possible to minimize the demands on, and the cost of, equipment at central switching offices.



IF THE  
TELEPHONE WERE  
TRULY PEOPLE-  
CENTERED,  
CALLER AND  
RECIPIENT ALIKE  
COULD USE IT  
IN WHATEVER  
WAY BEST FITS  
THEIR NEEDS.



But it is possible to develop a more humane technology for the telephone—one that addresses the needs of both callers and call recipients. For one thing, callers do not always wish to contact recipients—it is sometimes more efficient to leave a message without conversing or explaining to various intermediaries who might answer the call. Wouldn't it be nice if the caller could specify whether the call is intended for a message center or for the actual recipient? Similarly, from the recipient's point of view, wouldn't it be nice to know who is on the phone, and maybe even why, before deciding whether to answer? The service that telephone companies now offer known as Caller ID is not the answer. Caller ID identifies the telephone number, not the person, and raises serious privacy concerns.

The answering machine helps by allowing the recipient to screen a call and intercept it before the caller has hung up. But the technical capabilities of the phone itself are currently limited by the low bandwidth of the wires that connect the home to the central switching office, and by the standard home telephone's limited keypad and lack of visual displays. Fortunately, these limitations are evaporating.

Suppose instead that upon placing a call, the caller could also give a three-second message that would be delivered along with the ring. The recipient would hear *"ring...this is Julie for Don...ring"* or perhaps *"ring...Petersen's Auto Repair with a question about your car...ring."* Better yet, just as in normal conversation, suppose the ring were interpreted as a request to schedule a conversation—not, as it is now, a demand for instant talk. Let the recipient choose whether to answer or to signal something like *"in five minutes, please."* The caller could decide whether to call back then (the telephone could do that automatically) or to deliver a message to the message center. This would be a true, people-centered technology: caller and recipient alike could use it in whatever way best fits their needs.

### Appropriate Transformations

Technology has provided many benefits to society. We would not want to go without them. But at the same time, technology has too often trapped us into







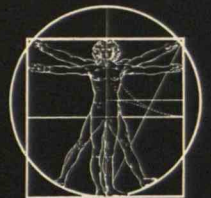
a machine-centered mode of life, dominated by the needs of technology itself. This wasn't deliberate. It came about naturally as an unintended side-effect of the rapid expansion of machines into human activities. But there is an alternative approach.

Today's technology is increasingly centered around information. Because information is essentially invisible and information-processing machines have no moving parts, they have no natural way of showing their operation to us. We are entirely dependent on the skills of the designers to present us with an intelligible, humane means of interacting with and understanding the information that the systems provide.

The good news is that these machines can take on whatever appearance and mode of operation are best suited for their users. For the first time in history, we are truly free to make machines that fit human needs, independent of mechanical constraints.

New information technologies can enhance the power of human thinking, for machine plus person can do more than either alone, but only if the technology complements human abilities. A calculator is a good example of a complementary skill: calculators work very differently from the human mind, which is why they are so valuable. They can perform arithmetic operations rapidly and efficiently without error. Humans are good at inventing the problems; calculators are good tools for solving them. Calculators are well matched to our needs, expanding our mental capabilities.

We need more information-processing tools that complement our thinking, reasoning, and memory skills as comfortably as the calculator enhances our arithmetic skills.



IDENTIFYING  
TELEVISION AND  
RADIO CHANNELS  
BY NUMBER OR  
FREQUENCY IS  
LIKE ORGANIZING  
A BOOKSTORE  
BY PUBLISHER  
INSTEAD OF BY  
TOPIC, CONTENT,  
AND AUTHOR.



The best of these technologies provide us with rich information about a topic of interest and leave control of the process—and what to do with the results—in our hands. The daily newspaper is a fine example of a large database that allows ready access to information about events in the local region and throughout the world. The technology is nonobtrusive, perhaps because it has no choice: it is a passive, surface artifact that requires all the major work to be done by the user. This does not stop it from being very effective.

But newspapers, like dictionaries and encyclopedias, are restricted to a linear, sequential structure. Dictionaries and encyclopedias are further restricted by the convention of alphabetical order. But today's technology can free us from the limits of yesterday's technology. Dictionaries and encyclopedias no longer have to have any single, fixed organization. Instead, they can have any organizational structure that the user needs at the moment. Merge the dictionary, encyclopedia, and thesaurus so that information can be selected by name, description, or content. Insert a good spelling program so that even misspelled entries can get the desired information to the user.

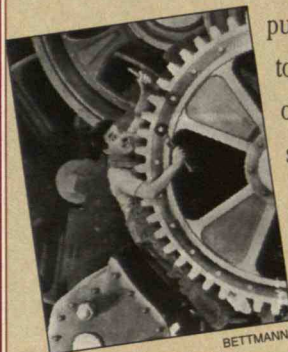
We can transform the hard technology of computers and information processing into soft technology suitable for people if we start with the needs of the human users, not with the requirements of the technology. With some thought, it is possible to transform even the most inhumane of systems. ♦

## TechnologyReview

# PHOTO CONTEST

### WIN \$500!

**It may be your turn** to display your work in a *Technology Review* photo essay. We are holding a photo contest on the general theme of "ENCOUNTERING THE MACHINE"—how people interact with technology, whether motivated by love, hate, or anything in between. We will



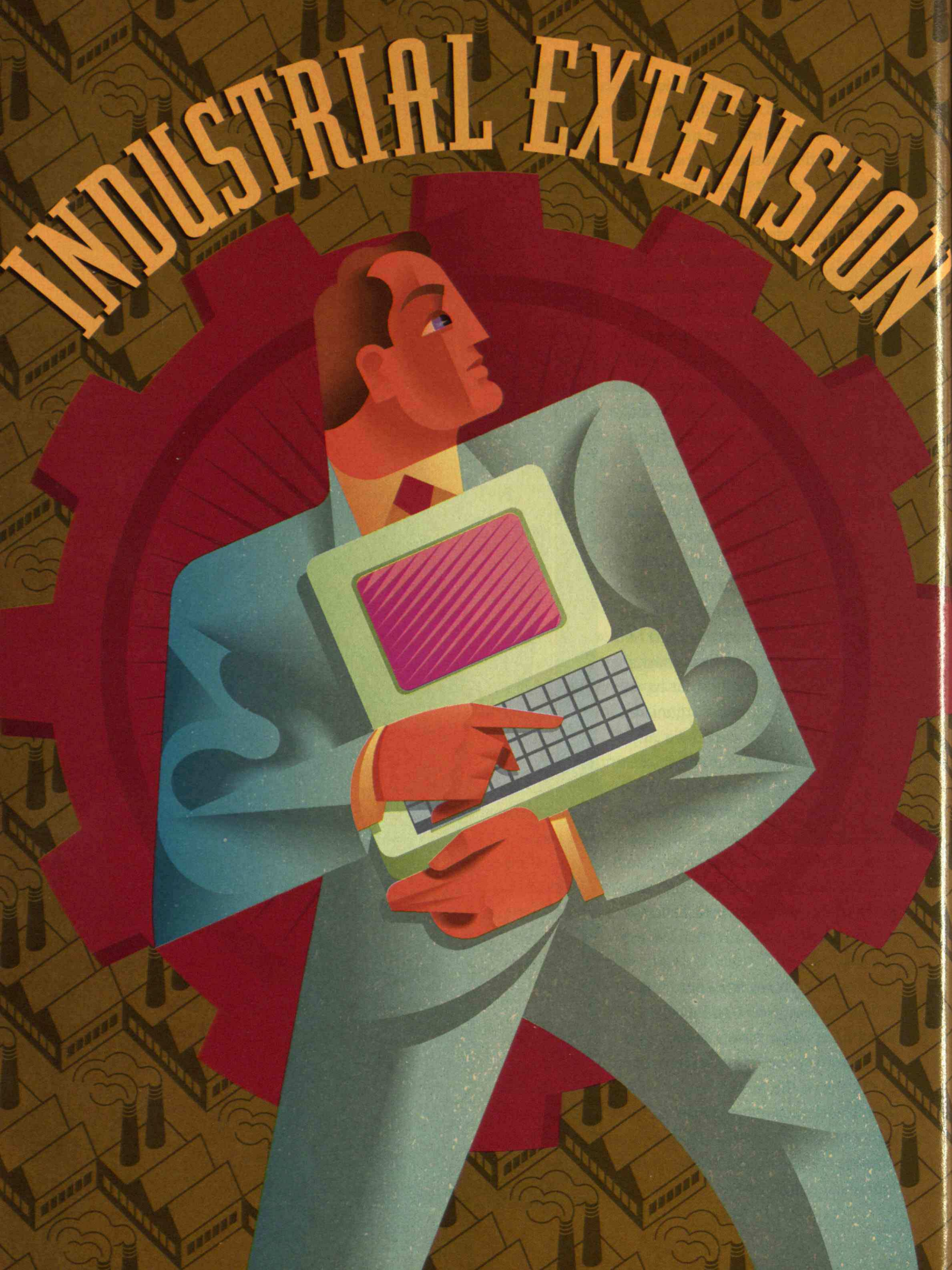
publish a selection of the winning photographs later this year and award prizes of \$500, \$300, and \$200 to the first-, second-, and third-place winners.

To enter, please send no more than six previously unpublished entries—prints or slides in a sleeve—to Photo Essay Contest, *Technology Review*, MIT, Bldg. W59-203, Cambridge, MA 02139. For sending entries by overnight mail, *Technology Review's* street address is 201 Vassar St., Cambridge, MA 02139. All entries must be postmarked no later than October 1, 1993.

*Technology Review* acquires the right to publish the award-winning photographs, including honorable mentions, in one issue. Entries without return envelopes and sufficient postage will not be returned, and we cannot take responsibility for loss or damage. Please include cardboard for protection and your name on each slide cover or the back of each photograph, and note the type of film and photographic equipment used. We regret that we cannot take telephone calls about the contest.

## Good luck!





# INDUSTRIAL EXTENSION



BY  
LEO REDDY

# Industrial-Strength Aid for Small Business

LAST fall Ignacio Lopez, then the controversial chief procurement officer of General Motors, rocked U.S. auto suppliers when he proclaimed that henceforth GM would buy its components only from companies that measured up to "world-class standards of quality and cost reduction." Lopez followed up with a program to force further price cuts and reduce GM's supplier base, thereby streamlining operations. These

actions, which amounted to an invitation to foreign manufacturers to submit bids for contracts, shocked the company's well-entrenched suppliers, since GM traditionally procured a large portion of its parts from U.S. firms. This one-two punch threatened a major loss of business—not to mention extensive layoffs and plant closings—among thousands of domestic auto suppliers.

GM was not the first or only U.S. corporation to take such

measures. For more than a decade, large businesses in nearly all industries have been shrinking their supplier base and turning to foreign sources to meet stiffer requirements for quality, cost, and delivery. Still, the abrupt and devastating effects of Lopez's directives sounded the alarm for a vast number of U.S. factories that haven't kept pace with competitive manufacturing practices.

Unfortunately, the small suppliers in most desper-

ate need of upgrades are the ones least able to afford them. In fact, the Industrial Technology Institute, a research and development group in Ann Arbor, Mich., recently found that the productivity and earnings of small and medium-sized manufacturers—factories with fewer than 500 employees—have been declining steadily compared with larger firms. These companies

have had fewer resources to devote to plant modernization and employee training. As a

CONGRESS HAS APPROVED  
AN UNPRECEDENTED INDUSTRIAL-  
EXTENSION PROGRAM TO HELP SMALL  
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TECHNIQUES. THE CHALLENGE  
NOW IS TO MAKE SURE  
THE SYSTEM WORKS.



result, they have fallen far behind large corporations in computer-aided design, engineering, and manufacturing as well as in the use of other advanced tools and techniques that have enabled larger firms to produce high-quality goods at competitive prices.

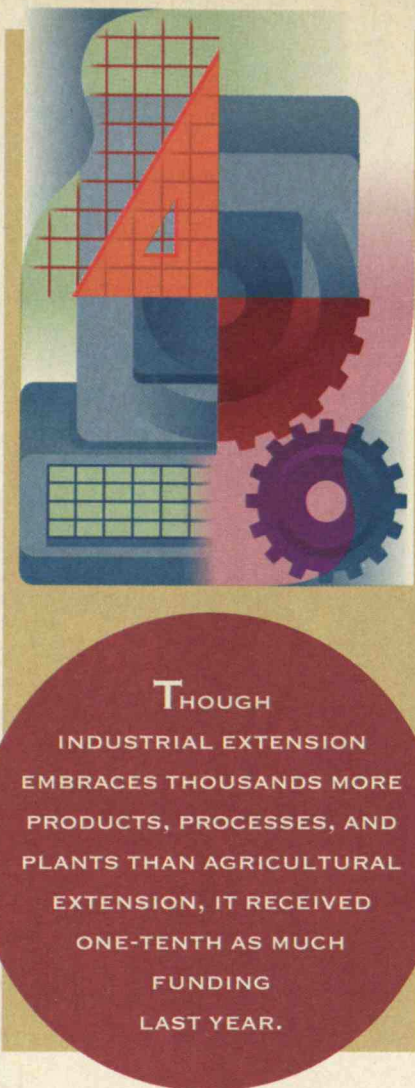
The good news is that the Clinton administration recognizes the problem and is championing an effort to find a solution. In fact, since last September when candidate Clinton proposed creating 170 industrial extension centers "to help small and medium-sized manufacturers choose the right equipment, adopt the top business practices, and learn cutting-edge production techniques," the idea has gained momentum. Congress endorsed this idea last fall when it approved a twelvefold increase in federal funding for industrial extension programs.

But while this level of support surpasses what most advocates considered possible less than a year ago, it cannot by itself guarantee that extension services will be readily available to the enormous number of firms that need them. To help ensure the effectiveness of extension centers, steps must be taken to equip agents with the latest and most effective manufacturing tools as well as knowledge of how best to use them. And a comparable commitment must come from state and local governments as well as from large manufacturers, which ultimately stand to gain if smaller domestic suppliers become more capable and productive.

#### ROOTS IN AGRICULTURAL EXTENSION

ONE apparent reason for the enthusiastic support of industrial extension is its apparent likeness to the Agricultural Extension Service (AES), a program that has been respected in U.S. farming communities for the past 75 years. Although the extension service has become increasingly sophisticated, it is based on a simple concept: experts in agrarian technology from state universities, land-grant colleges, and the

*LEO REDDY is president of the National Coalition for Advanced Manufacturing, a nonprofit organization in Washington, D.C., that advocates modernizing U.S. industry to improve its economic competitiveness.*



Department of Agriculture's research program are given funding, by both states and the federal government, to visit farms and help them adopt modern methods.

By almost any measure, the AES has worked. It has helped to make U.S. agriculture the most bountiful in the world, reducing the farm workforce to a tiny fraction of the population while increasing productivity more than tenfold.

Advocates for industrial extension often cite the AES example, since both are designed to convey advanced technologies to small and medium-sized producers. But the deployment of advanced manufacturing technologies and related know-how is a far more complex undertaking. Manufacturing encompasses a vast range of activities embracing dozens of distinct industrial sectors, tens of thousands of different production methods, and hundreds of thousands of products. And because advanced manufacturing equipment is far less mobile than farm equipment, well-equipped technology centers that replicate the factory floor are often required for demonstrations.

Another major difference is the level of funding and scope of the programs. In 1992, the AES budget was about \$1 billion, to which the federal government contributed more than \$400 million. By contrast, industrial extension programs received less than \$100 million, toward which the federal government kicked in just \$17 million. Also, AES offices are located in more than 3,000 U.S. farm counties while industrial extension offices number fewer than 100 and reach only a small fraction of manufacturing firms.

Finally, the whole concept of technology extension has come much more recently to manufacturing than to agriculture. While a few industrial programs date from the 1950s, most of the 20 state services operating today began only in the 1980s, primarily in response to rising concerns about the strength of U.S. manufacturers in global markets. The federal government did not start industrial extension activities until 1988, when Congress authorized three Manufacturing Technology Center (MTC) programs and a State Technology Extension Program (STEP) administered by the Department of Commerce's National Institute of Standards and Technology (NIST).



## EXTENDING THE CONCEPT OF EXTENSION

**G**REETED with little enthusiasm by the Bush administration, supporters of the federal MTC program have fought an uphill battle to expand both the number of centers from three to seven over the past four years and their level of funding from about \$10 million to \$17 million. And only annual intervention by Congress has preserved the modest \$1.5 million STEP budget.

Despite such modest support, the MTC program has thus far assisted more than 6,500 companies, which have reported \$250 million in added benefits. And STEP has managed to build and improve the technology assistance infrastructure in 38 states, helping several start their own industrial extension programs.

Because these models offer businesses a cost-effective means of receiving high-quality advice without commercial bias, they have been so well received that the demand for services has far outstripped their availability. Recognizing the potential benefits of creating a wider network of extension centers to meet this demand, Congress passed legislation last fall that would appropriate some \$200 million for industrial extension from the \$1.7 billion Department of Defense (DOD) conversion and reinvestment package.

Under the plan, NIST will administer the Manufacturing Extension Partnership, which will incorporate both the STEP and MTC programs. Applications for local extension-center funding—expected to number in the hundreds by the deadline this July—will be reviewed by the Defense Technology Conversion Council, chaired by the Pentagon's Advanced Research Projects Agency.

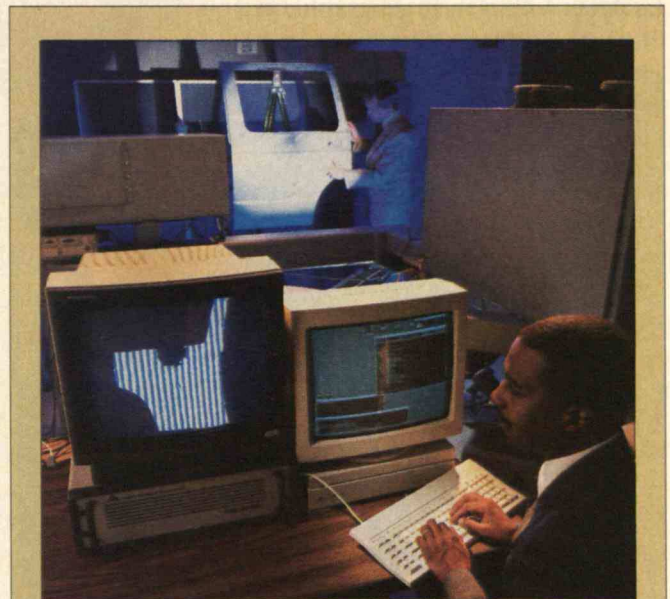
Congress will also consider a program this year as part of the National Competitiveness Act that will channel funds to the Department of Commerce as extension support under the DOD conversion package tapers off. The bill—sponsored by George Brown, chair of the House Science, Space and Technology Committee, and Ernest Hollings, chair of the Senate Commerce Committee—promises an additional \$150 million in financial support for extension programs under NIST for fiscal year 1995. These funds are expected to rise to \$500 million for 1996 and 1997.

Other federal agencies besides NIST and DOD will help expand the program's reach. Given their storehouse of manufacturing expertise—and the president's support for extension—the national labs under the Department of Energy, as well as the National Science Foundation and National Aeronautics and Space Administration (NASA), will likely become more active in working with and supporting programs around the country. In fact, NASA has already established a national network of six technology transfer centers and

is building a major new national headquarters in West Virginia.

The new legislative packages are designed to expand the number of centers that qualify for federal funding by broadening "extension" to embrace a variety of state and local institutions already engaged in deploying advanced manufacturing technologies to industry. For example, the DOD authorization bill defines manufacturing extension as any "public or private nonprofit program for the improvement of the quality, productivity, and performance of small manufacturing firms." And the proposed National Competitiveness Act includes federal, state, and local agencies as well as universities, schools, laboratories, small business development centers, professional society programs, and industrial organizations, as qualifying outreach centers.

As this broad range suggests, industrial extension within the federal lexicon now refers not only to the more traditional concept of agents making in-plant visits as consultants and troubleshooters, but also institutions such as community and technical colleges and worker training institutes to which manufacturing firms could send their employees. Hundreds of these institutions are already operating across the country and, with federal backing, could be the nucleus of the expanded national network of industrial extension.



*The Manufacturing Technology Center in Ann Arbor, Mich.—one of seven such federal programs that receive matching funds from state governments—has helped 230 small firms save more than \$15 million since 1991. Besides offering consulting advice, the center develops problem-solving technologies such as this highly sensitive optical-inspection system.*



Some of these centers work closely with vendors of manufacturing technology. For example, IBM has spent millions supporting computer-integrated manufacturing (CIM) centers at 93 community and technical colleges and universities under the IBM CIM in Higher Education Alliance. And Autodesk, a major manufacturer of software for computer-aided drafting and design, supports the Alliance for Manufacturing Productivity, an education and support program conducted at some 40 community colleges and technical schools across the country.

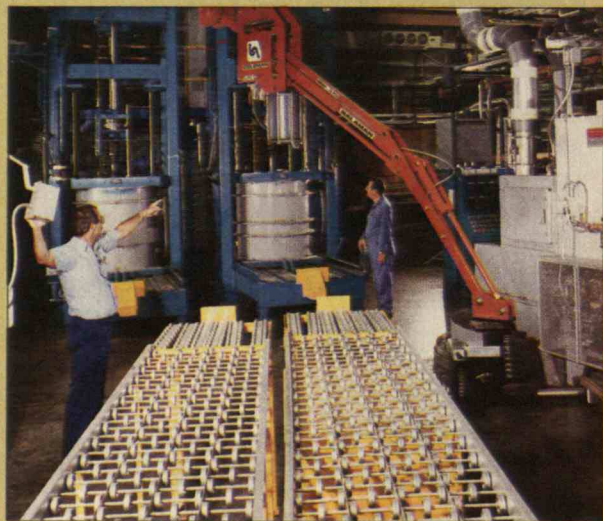
The broad definition of extension centers leaves room for new kinds of technology-deployment facilities. One of the most innovative is the "teaching factory." Similar to a teaching hospital, where doctors receive on-the-job training, the teaching factory would provide demonstrations and training in a factory-floor environment. The guiding theory is that manufacturers can make more informed decisions when given the chance to evaluate how new technologies solve actual problems.

The National Center for Manufacturing Sciences, a non-profit industrial research consortium in Ann Arbor, Mich., has been especially active in promoting teaching factories as a means of accelerating the adoption of new manufacturing technologies. The group hopes to establish a nationwide network in partnership with extension services so that agents can refer small manufacturers to facilities within their geographic region.

## TRAINING THE TRAINERS

**W**HILE new federal funding will go a long way toward supporting more than 100 technology extension centers, it will accomplish only half the job. For the program to succeed, extension organizations must not only have the modern tools in hand that can make a significant, long-term impact on smaller companies, but their agents must be well versed in how to use them effectively in a wide range of applications. They must possess advanced knowledge of the spectrum of proven manufacturing techniques and technologies, including strategic business planning, total quality management, flexible manufacturing, computer-based production, manufacturing resource planning, statistical process control, and just-in-time inventory control, to name only a few.

To be well equipped with these modern tools, extension agents must themselves undergo periodic training. Manufacturing Technology Centers, teaching factories, and other large technical institutions could play a valuable role in providing this training to field agents. The extension centers could also establish a means of networking amongst themselves in order to improve their referral system and emulate each other's best practices. One example that could serve as a model is the Modernization Forum, a professional organization that acts as a catalyst among the seven NIST Manufacturing



*The Oak Ridge National Laboratory is one of several defense facilities that has joined the effort to modernize small civilian factories. Since 1991, the lab has dispatched experts to 100 firms and used its plant to demonstrate new technologies, such as this automated plastics-forming process that combines mechanical, electronic, hydraulic, and robotic equipment.*



*The teaching factory, a new concept in extension services, solves real problems for local firms in a simulated factory environment. At the Byrd Institute, a teaching facility at Marshall University in Huntington, W.Va., an expert in computer-aided manufacturing shows a machinist from a nearby plant how to generate drawings and machine codes for his firm's parts.*



Technology Centers as well as a bridge to other organizations in the field.

Perhaps as significant, extension-center representatives have a great opportunity to go beyond recommending tried-and-true practices and tools to solve discrete technical problems. Given their position at the forefront of manufacturing, they can also be a rich source of information on leading-edge, and in some cases prototypical, services and technologies.

One such experimental state-of-the-art service is an information hotline, or technology-access system, that makes advice immediately available to production managers and engineers on the factory floor. This service, set up by a Minnesota company called TelTech, puts the caller in touch with a bank of specialists, who also make referrals to more than 6,000 national experts under contract to TelTech.

The Manufacturing Technology Center in Minnesota already makes use of this system. But to make it accessible to more small firms, the Small Business Administration and NIST have combined to offer it on a no-cost or low-cost basis through Small Business Development Centers in six states. Thus far, these pilot projects have assisted over 1,500 smaller companies.

Another new service is designed to simplify the tortuous investment process. When a smaller firm decides to acquire advanced hardware or software, it often faces huge obstacles in finding sources of capital for this long-term investment, not the least of which is the banking system's unfamiliarity with manufacturing technology and the likely payoff from industrial modernization.

Industrial extension centers could help the firm qualify for modernization funds by providing technical appraisals of loan applications—much as independent mortgage agents evaluate properties for lending institutions. While the banks would still assess the applicant's financial credentials, the center would evaluate the technical soundness of the modernization plan.

Yet another new tool, advanced fiber-optic telecommunications systems similar to those already used by some schools, public facilities, and large companies, could make employee training more affordable. With guidance from the regional phone system, a company could readily build a facility that could receive trans-

missions from instructors at distant manufacturing technology centers, teaching factories, or vocational-technical institutions at relatively low cost. This would enable companies to use the expertise of remote technology centers to train employees right in their own plants.

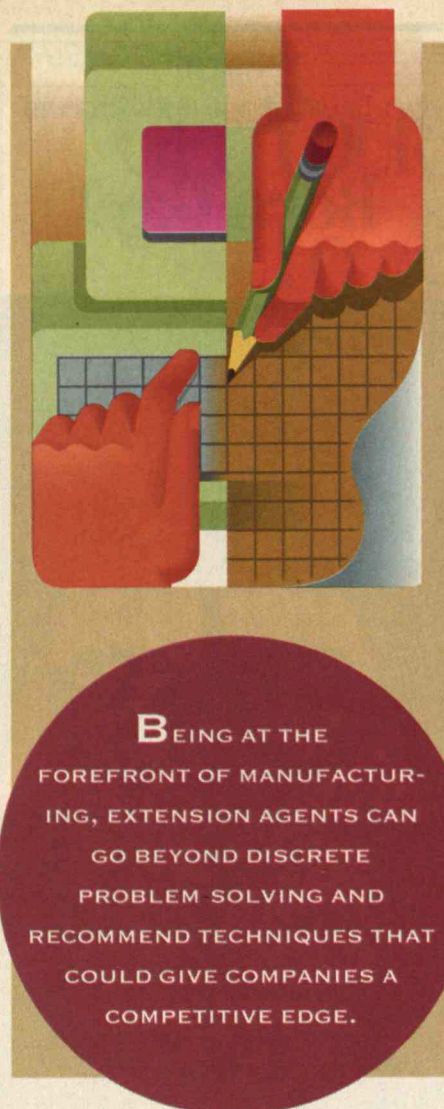
#### FIRM COMMITMENTS

**B**UILDING an effective infrastructure of technical assistance for the roughly 360,000 U.S. manufacturing establishments with fewer than 500 employees will be a complex undertaking. For it to succeed, presidential leadership must be matched by a similar commitment by all involved. Congress and the Clinton administration will be observing the performance of industrial service centers closely to make sure that scarce federal tax dollars are being wisely invested. Thus it is especially important that small firms offer feedback on the quality of extension services so that centers can base their recommendations on what works. Favorable

testimony from businesses served by industrial-extension services will be the best guarantee of continued and growing federal support.

Large manufacturers also have a critical role to play; they must lend financial support and encourage their suppliers to avail themselves of these services. While large firms may not receive the immediate payoff that small companies will enjoy, these firms can make use of extension services as a cost-effective complement to their own supplier-base improvement programs, and even direct some of their own branch plants to use these services. And all large firms will reap the rewards of a stronger domestic industrial base, not only in securing reliable sources of supply but also in helping to build a robust U.S. economy as their principal customer base.

An effort of this magnitude is a gamble, not merely for the federal and state governments and other organizations that provide funding, but also for the small and medium-sized firms that must spend their limited time and resources implementing unfamiliar tools and techniques. However, the potential national economic security benefits of building the world's most advanced manufacturing base far outweigh the risks. ■





## Born Gay?

**I**N an era when researchers have located the genes for conditions such as Huntington's disease, cystic fibrosis, and Duchenne muscular dystrophy, some scientists believe that "homosexual" genes will soon be found. It comes as no surprise, then, that lately the popular press has been humming with stories about whether homosexuality is genetically determined.

We are uneasy about the current unbridled enthusiasm for studies relating genes with human behavior. Scientists' arguments for a biological basis for human differences have previously been used for insidious ends; the arguments by German scientists before World War II for the genetic inferiority of Jews is just one example.

Moreover, much of the older scientific analysis of the origins of human behavior, particularly using biological methods, has been debunked. In the nineteenth century, for instance, "phrenologists" claimed that they could predict aspects of an individual's personality, such as sexuality, intelligence, and criminal tendencies, merely by examining the skull's structure. Despite its popularity, this "science," which often included explicitly racist implications, was not based on any reliable evidence. More recently, after studies in prisons in the 1960s, geneticists jumped to the conclusion that males with an extra Y chromosome were more likely to be criminals than other men. Follow-up studies in the general population showed that this claim was unwarranted.

But that is the past. It's always possible that the field



*The public should  
not read too much into  
recent studies suggesting genetic  
origins for homosexuality  
and other aspects of  
human behavior.*

of human behavioral genetics has shaken off its tawdry history. Today, when sophisticated techniques can be used to analyze human DNA, maybe the renewed interest in connecting biology and behavior portends the development of a more scientific era. On the other hand, maybe not. A look at recent studies seeking a genetic basis for homosexuality suggests that many of the problems of the past have recurred. We may be in for a new molecular phrenology rather than true scientific progress and insight into behavior.

### Determining Sexual Preference

The first issue to reckon with when conducting studies of homosexuality or other behavior entails developing a clear-cut picture of who exhibits the trait and who doesn't. This "labeling" problem is exemplified in recent research of Simon LeVay, a respected neuroanatomist. While at the Salk Institute in La Jolla, Calif., LeVay did postmortem examinations of the brains of primarily young male victims of AIDS. In a study published in *Science* in 1991, he reported a difference between heterosexual and homosexual males in the size of the hypothalamus. But he could not really be certain about his subjects' sexual preferences, since they were dead. Also, the research design and subject sample did not allow others to determine whether it was sexual behavior, drug use, or disease history that was correlated with the observed differences among the subjects' brains.

Even for the living, scien-



tists must decide whether, when trying to classify a person as gay, to rely on the frequency of homosexual behavior, the age at which it began, or, as some psychiatrists have suggested, the presence of homoerotic fantasies. Compounding this difficulty is the reluctance of many gay people to admit their sexual preference. In this situation one can easily create inaccurate or inconsistent study groups.

A related problem cropped up in a study by Michael Bailey, a psychologist at Northwestern University, and Richard Pillard, a psychiatrist at Boston University School of Medicine. In research published in 1991 in *Archives of General Psychiatry*, they reported that among identical twins reared together, each individual had a high probability (52 percent) of being homosexual if the other twin was. For non-identical twins, adopted brothers, and non-twin siblings, the correlations were much lower (22, 11, and 9 percent, respectively).

The researchers solicited participation for their study through advertisements in gay newspapers. But this could well have produced a biased sample. It is not unreasonable to think that identical twins who are both openly homosexual would be more likely to volunteer for such a study because of the shared knowledge that they are both comfortable with their sexuality. Furthermore, if one gay twin "comes out," it might be easier for the other to do the same.

While the authors interpreted their findings as evidence for a genetic basis for homosexuality, we think that the data in fact provide strong evidence for the influence of the environment. On average, both non-identical twins and non-twin siblings share 50 percent of their genes. If homosexuality were a genetic trait, the pairs in these groups should be homosexual a similar percentage of the time. They certainly should be homosexual more often than adopted siblings. But Bailey and Pillard's data do not fit those predictions.

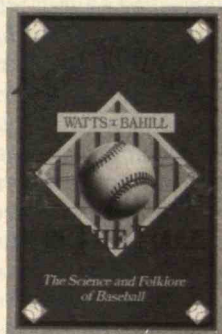
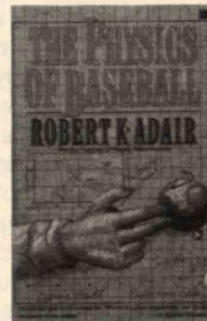
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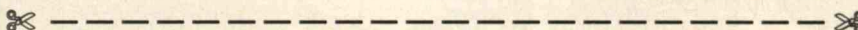
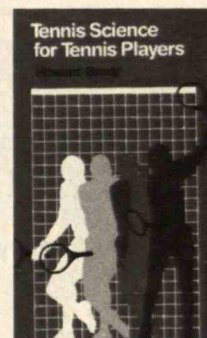
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### Distinguishing Cause from Effect

ence of an individual, even as an adult, can significantly affect brain development. One's emotions, life's stresses, and numerous other environmental factors can alter the metabolism of the brain and presumably its internal connections.

The problem of distinguishing between cause and effect is perhaps most clearly illustrated by considering genetics and criminality. There is a correlation between genes and the likelihood of incarceration in the United States: a majority of prisoners have inherited dark skin color. But genetics clearly has nothing to do with the fact that the rate of black male incarceration has quadrupled over the last four decades, as Troy Duster, a University of California at Berkeley sociologist, has pointed out. Rather, racism and the tenuous economic power of so much of the African-American population likely

Studies of human behavioral genetics could benefit society. But until geneticists pay more than lip service to the problems in their studies and the complex interactions of genes and the environment, history may simply repeat itself.

It is time to hold behavioral-genetics research to higher standards than in the past, and to recognize that the work is conducted in a society colored by prejudice, stigma, and discrimination. ■

PAUL BILLINGS, formerly chief of the Division of Genetic Medicine at California Pacific Medical Center in San Francisco, is now head of general internal medicine at the Palo Alto Veterans Administration Hospital. JONATHAN BECKWITH is American Cancer Society research professor in the Department of Microbiology and Molecular Genetics at Harvard Medical School.

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## Progress for the Birds

**R**ECENTLY, the birdwatching community, of which I am a sometime member, has been touched by melancholy and apprehension. It seems that there are fewer birds than there used to be. According to a recent editorial in *American Birds*, "The evidence is in and clear that several species are declining and many populations are showing signs of distress." This should trouble everyone, not just birders, according to the editorial, because the number and diversity of birds "mirror the health of the global environment."

A generation ago, Rachel Carson, in *Silent Spring*, used the distress of birds to alert the public to the dangers of chemical pesticides. Her warning had good effect, and with the banning of DDT, the affected species, most notably the osprey, substantially recovered. The present crisis can't be traced to a single cause. The main problem seems to be "development"—in North America, where many species nest and breed, in South America, where many species spend the North American winter, and on the flyways in between.

Still, I do not share the pessimism, verging on angst, of my fellow birders. To the contrary, the history of birds in America gives me reason to be hopeful. It is a fact—less known than it ought to be—that human development has serendipitously helped many species of birds to thrive. The primeval forest is not a congenial environment for most birds. When timberland is partly cleared, the "edge" that is created, with plants in various stages of growth, provides habitat for many of our most cherished songbirds.

Some birds prefer living with humans to the wild, and I do not refer just to pigeons. The list of species that have taken happily to towns and suburbs includes chimney swifts, phoebes, swallows, and nighthawks (who lay their eggs on the flat gravel roofs of commercial buildings). According to Roger Tory Peterson, renowned dean of birding, there are perhaps a billion or two more songbirds in the United States today than there were before the arrival of the Pilgrims.

This is not to say that human civiliza-

tion is not a serious menace to our avifauna. Since the arrival of Europeans in North America five centuries ago, four native species have become extinct: the Labrador duck, the great auk, the passenger pigeon, and the Carolina parakeet. Three others have not been sighted in over 30 years: the ivory-bill woodpecker, Bachman's warbler, and the Eskimo curlew. Add five American subspecies, including the dusky seaside sparrow, the last of which died in captivity in 1987, and you still have a number that seems amazingly small. Considering the speed and voracity with which the United States was developed, one looks for reasons why the destruction was not far worse.

We could have exterminated most of our wild birds—for food, for feathers, for sport, for egg and nest collections, or through destruction of habitat—but we haven't. According to Peterson, "We

Park Service administers an additional 80 million acres of protected land, and the national forests embrace 176 million acres. There are also countless state, municipal, and private parks and sanctuaries. The hunting of waterfowl is strictly regulated, and the harming of most other wild birds is totally prohibited. Endangered species are safeguarded, however tenuously, by law.

In response to the current alarm about declining avian populations, the Audubon Society has launched a program called Birds in the Balance. Fact gathering and study will be followed by actions to preserve habitat where it is most needed. In anticipation of debate about the Endangered Species Act, the Interior Department has proposed a survey to map the nation's ecosystems and biological diversity, much as the U.S. Geological Survey maps the country's geology and geography. In many localities, devel-



seem to sober up at the eleventh hour, so we establish laws, game regulations, soil conservation practices, national forests, national parks, sanctuaries, and wildlife refuges."

The first protective regulations date back to the earliest Dutch settlements more than 300 years ago. By 1776, 12 of the 13 original colonies had some sort of game laws. In 1900 the National Audubon Society started to set aside bird sanctuaries, and in 1903 President Theodore Roosevelt established the first federal bird reservations. Today, the U.S. Fish and Wildlife Service manages more than 350 of these reservations, covering more than 20 million acres. The National

operators are negotiating agreements with government and environmental groups to set aside wildlife preserves when building malls or housing tracts. I find these purposeful actions—past, present, and contemplated—tremendously reassuring. In the end, we learn from the birds that our forebears were more sensitive about the environment than we might have thought, that we have reason to be thankful to them, and that we had better do likewise. ■

*SAMUEL C. FLORMAN, a civil engineer, is the author of Engineering and the Liberal Arts, The Existential Pleasures of Engineering, Blaming Technology, and The Civilized Engineer.*



# Home Improvement

**W**HEN it comes to industrial policy, most of the responsibilities of national governments haven't changed much over the years. The public sector must set standards; provide for training (and retraining) the work force; build and maintain infrastructure; promote the diffusion of new technical know-how; and provide development finance to fill cracks in the system that private capital cannot or will not fill.

But now that every nation's companies are forming international alliances, an important new question arises: Whose industry should a government work with? In providing assistance for training or for R&D, for instance, why not give public support to whatever country's companies set up shop on our shores? Why should the U.S. government favor companies that are based here over (say) Japanese companies that have built factories here? As U.S.-based corporations ally themselves with Japanese and German partners, not to mention Mexican and Korean ones, what does a "national" industrial policy really mean? Given the continuing battle within Sematech (the flagship example in the United States of government-business planning) over the exclusion of the foreign partners of the American members, this question is anything but academic.

Secretary of Labor Robert Reich set off a bombshell a few years back with his proclamation that for all practical purposes, multinational corporations no longer exhibit loyalty to any national government (let alone to any particular site or region) and that they no longer want or need a home base. They have become entities unto themselves, depending only on a steady supply of well-trained professionals and technicians.

But business is not really quite so foot-loose. Laura D'Andrea Tyson, chair of the Council of Economic Advisers, points out that U.S.-owned companies still produce the lion's share of their output within our borders—and that the same domestic focus holds true for

Japanese and German industry.

In fact, according to the Harvard Business School's Michael Porter, a home base of mutually supportive institutions is even more important to companies now. Success in global competition, he says, will come to organizations with access to highly trained workers, good infrastructure, and reliable sources of financing. At the same time, says Porter, a sizable and growing home market confers upon domestically based companies economies of scale and creates a population of "sophisticated and demanding" customers who push attention to quality, training, and innovation down the supplier chain. Sharp and pervasive rivalry among both local competitors and suppliers pressures companies to invest and innovate, further contributing to a company's competitive edge.

Porter believes that these complex

historian William Lazonick of Columbia University, is that U.S. companies are deliberately situating their overseas divisions within the more highly developed home bases of their foreign competitors. If IBM of Japan and Ford of Europe are innovating more rapidly and producing more efficiently than their U.S. parents, it may well be because the overseas divisions have become deeply involved with local suppliers, customers, competitors, and governments in the Far East and Europe. In other words, these countries are constructing just the kinds of supportive environments that Porter describes while the United States is not—and the results are revealed on the bottom line.

Nation-based industrial policy still has a role, then. Governments can work with business to erect supportive environments whose sheer complexity makes them unlikely to arise solely from



relationships among customers, competitors, suppliers, and the governments that help to train labor and build the requisite infrastructure are more easily assembled and managed within the same geographic and cultural context. Moreover, since a company's (or sector's, or region's) initial lead in international competition may often be sustained over a long period of time, helping your own country's firms to "get there first" can have big payoffs.

But if a home base is so important, why are the offshore divisions of so many U.S. companies more profitable than their operations in this country?

The answer, according to economic

market forces. In addition to strengthening one's own industries, such environments may also attract additional investment from foreign-based companies—bringing new jobs, taxes, and technical know-how. In the end, which companies are "ours," which are "theirs," and for whom such environments would be "home" may be less important than getting on with the business of creating and nurturing the supportive environments in the first place. ■

*BENNETT HARRISON teaches economic development and industrial policy in the Heinz School of Public Policy and Management at Carnegie Mellon University.*



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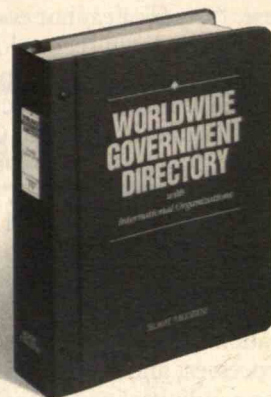
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# Reviews

## BOOKS

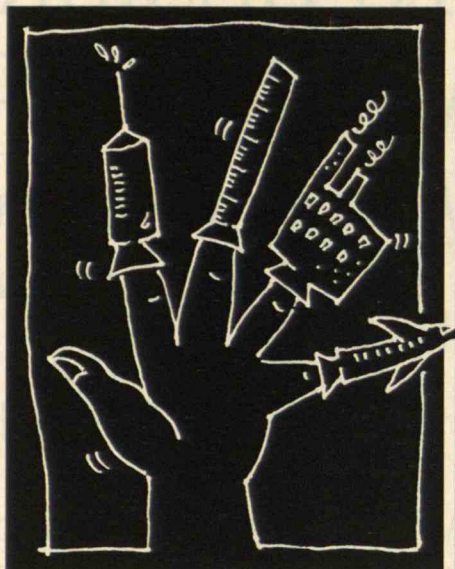
### ORCHESTRATING FEDERAL R&D

*Beyond Spinoff: Military and Commercial Technologies in a Changing World*  
by John A. Alic, Lewis M. Branscomb,  
Harvey Brooks, Ashton B. Carter,  
and Gerald L. Epstein  
Harvard Business School Press, \$35

BY DOROTHY ROBYN

IF the Clinton administration fulfills its campaign promises for research, the emphasis will be squarely on renewing the civilian technology base. "America cannot continue to rely on trickle-down technology from the military to maintain competitiveness of its high-tech and manufacturing industries," said candidate Bill Clinton in his technology position paper. "Civilian industry, not the military, is the driving force behind advanced technology today." Clinton vowed to shift billions of dollars from military to civilian research in advanced materials, information technology, new manufacturing processes, and other areas that would boost industrial performance.

Paradoxically, the key institution for bringing about this vision of a new federal role directly addressing the technology needs of commercial industry may be the Department of Defense, according to the five experts in technology policy who authored *Beyond Spinoff*. In part, that's because of the Pentagon's sheer dominance: although defense spending is declining, it still accounts for more than a quarter of the nation's R&D and supports 15 percent of our scientists and engineers. More important, civilian products ranging from computer chips to sensors are becoming both less expensive and more sophisticated than their military counterparts. Thus, faced with a leaner budget, Defense must for its own sake learn to



rely more heavily on civilian industry. (See "Toward an Integrated Industrial Complex," page 24.)

The good news is that such a "dual-use" strategy is eminently feasible from the standpoint of technology. Granted, many defense and commercial applications diverge: the graphite fiber used in Air Force jets is not the same as that found in golf clubs. But the supporting technologies—fiber optics, computer software, and polymer-matrix composites—are much the same in the two sectors, the authors maintain. Moreover, today's flexible manufacturing systems make possible the production, in a single plant, of both low-volume military equipment and equivalent high-volume commercial equipment.

The bad news is that despite the underlying similarity of the technology, the military and commercial worlds have grown ever more segregated over the past 25 years. Part of the problem is a clash of engineering cultures. The Pentagon values technical performance, regardless of cost; that leads to an emphasis on "big leap" innovations. Commercial firms, by contrast, must continually trade off performance and cost, putting a priority on small, incremental improvements.

Even more problematic are the vari-

ous requirements imposed on defense contractors by the Pentagon's acquisition system. Much has been written about the military's unrealistic technical requirements for the resistance of products to shock and temperature. Far more onerous, according to the authors, are idiosyncratic cost-accounting standards, information disclosure requirements, and unique process and product specifications. These requirements enhance bureaucratic oversight but exact a significant cost: many commercial manufacturers won't do business with the Pentagon, and those that do often wall off their defense production. As a result, the military is losing access to advanced technologies that are critical to developing future weapons.

#### Aiding Civilian Industry

Integrating commercial and military production would benefit civilian industry no less than it would the Department of Defense, say the authors. To attract commercial prime contractors, the Pentagon must bolster its investment in basic and applied research, which has the greatest dual-use potential. When defense budgets shrink, the Pentagon has historically protected weapons development; military support for upstream research is smaller now than it was 25 years ago, both in absolute terms and as a percentage of defense R&D. If that trend is reversed, even a leaner Department of Defense could play an important role in restoring industrial competitiveness, the authors maintain.

Toward that end, they suggest liberalizing the Pentagon's program for reimbursing contractors' R&D costs to include some nondefense research, particularly in high-priority areas such as manufacturing technology. They also recommend broadening the mission of the Defense Advanced Research Projects Agency. DARPA (originally named ARPA) has in the past supported key dual-use technologies in computing, communications, and advanced materials, but in recent years the agency has



been subject to budget strains as well as pressure from a White House that viewed such support as "industrial policy." Recent legislation instructs the Pentagon to remove the "Defense" in DARPA and expand the agency's charter, and the Clinton administration has complied. Although more needs to be done, these actions reflect the growing political consensus for Pentagon support of dual-use R&D.

As *Beyond Spinoff* is quick to recognize, there is no political consensus on what to do about barriers to dual use erected by the defense acquisition system. But the authors speculate that a shrinking defense budget, a likely reorientation of our Cold War defense strategy, and a sense of crisis over the health of U.S. industry may soon allow for sweeping legislative changes in the acquisition system. The alternative is for

the Pentagon to retreat into a "ghetto" of highly specialized (and hence high-cost) defense producers and dedicated arsenals.

### Beyond Dual Use

The promise of Pentagon-funded R&D notwithstanding, the authors argue that the federal government needs to go beyond dual use to address U.S. industry's competitive needs. Most striking is what they *don't* recommend—namely, the creation of a single, dominant civilian technology agency, such as that alluded to by the Clinton campaign (but not actually proposed by the new administration). Rather, these authors envision a decentralized R&D structure that draws on the strengths of existing agencies: (D)ARPA in pathbreaking information technologies, the National

Institute of Standards and Technology in metrology and other "infrastructural" technologies, the Department of Commerce in technology diffusion, and so on. The key, in the authors' view, is strong interagency coordination and support from a larger and better-funded White House Office of Science and Technology Policy.

Many technology policy advocates will find the authors' scheme too far-flung, but the Bush administration's initiative in high-performance computing (HPC) shows that a decentralized agency structure can be effective in pursuing specific technologies. This initiative, continuing under Clinton, casts multiple agencies in roles consistent with their mission and experience. For example, (D)ARPA is responsible for developing massively parallel computers (a technology it pioneered), the Department

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of Energy for developing software, and the National Science Foundation for managing the university HPC network. The lesson of HPC is this: White House support, not a centralized technology agency, is what matters.

*Beyond Spinoff* acknowledges that the challenge will be to get existing agencies to partner with industry. Like the Pentagon, other "mission-oriented" agencies must go beyond the traditional spinoff paradigm, with its emphasis on revolutionary breakthroughs and technical novelty. For NASA and the Department of Energy, that means less emphasis on big national projects such as aerospace planes and supercolliders, and more emphasis on the incremental R&D relevant to designing commercial products, improving quality, and cutting costs. For the National Institutes of

Health, that means gearing its \$10 billion research portfolio more closely to industry needs, such as better bioprocessing techniques. In short, the federal government ought to pursue what amounts to a dual-use strategy—one uniting public and commercial interests—for each of the mission agencies, not just the Pentagon. Trickle-down technology policy, like trickle-down economics, is no longer adequate, if indeed it ever was. ■

DOROTHY ROBYN, who wrote this review as a senior staff member of the congressional Joint Economic Committee, is now special assistant to the president for economic policy.

## BOOKS

FROM DATABASE  
TO DATABASE

*The Naked Consumer: How Our Private Lives  
Become Public Commodities*

by Erik Larson

Henry Holt and Co., \$23

BY JOHN CARROLL

CONGRATULATIONS, [YOUR NAME HERE]. You're the lucky reader of a brand-new review about the very latest book on target marketing and consumer privacy! Imagine how impressed the neighbors on [YOUR STREET HERE] will be when you tell them that you actually know how we got YOUR NAME HERE!

Erik Larson knows full well how they do it. In *The Naked Consumer* he reveals the painstaking, innovative, and at times truly bizarre ways that businesses gather information about us for marketing purposes. They monitor unsuspecting consumers through credit card records, frequent-shopper programs, even cameras implanted in bars of soap in grocery stores. In more controlled settings, marketers gauge reactions to products and ads through focus

groups, lie detectors, and pupilometers. These findings are electronically merged, purged, and regurgitated to form a pool of consumer information that has grown to the size of Lake Victoria—all in the interest of "marketing to a segment of one."

The explosion of such database technology, in Larson's view, has resulted in nothing less than the "commoditization" of the American public. Because consumers have lost control of information about themselves, he says, our lives and the events in them have become just a series of sales opportunities. Marketers know when we're expecting a baby, when we've purchased a house, when we've bought the farm. Like youngsters with their stacks of trading cards, businesses flip us and swap us and bundle us into neat little piles. Larson, a feature writer for the *Wall Street Journal*, sets out to reveal the many intricate ways companies use this accumulation of knowledge as a wedge to pry into our lives and influence our buying decisions.

The desire to identify potential customers and pinpoint their motivations has driven the advertising business since its inception. As far back as the 1920s, marketing trends that bedevil us to this day were already in full swing: advertising clutter, planned obsolescence, brand proliferation, and the abiding attitude that virtually all consumers possess a room-temperature IQ. Even then, advertisers fancied their craft a science, a delusion that has led to a bloodless, poll-driven, least-common-denominator industry.

## Recombinant Data

Larson's investigation into the new techniques of information gathering has convinced him that there are four basic laws of data dynamics: data will merge with complementary data, will be used for purposes other than originally planned, will remain confidential only until someone decides it's not, and will eventually harm one or more members of the group that supplied it. As an example of the latter, one clever marketer for an anti-aging cream compiled a list of likely

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a forest.



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with matches. Because  
without the forests, life is  
unimaginable.

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prospects and mailed out ads with before-and-after pictures with a note scrawled across the top along the lines of "Kathy—Try this. It works. R." A recently divorced woman, convinced that the note came from her ex-husband's new wife, murdered them both.

The basic material for the "recombinant data" used by marketers comes courtesy of the Census Bureau. Its decennial statistics constitute the foundation of every major marketing campaign in America. For a remarkably low price, the bureau sells its statistics to innumerable businesses whose sole function is packaging data for the use of marketers. These firms blend the statistics with readily available information from state and local governments, credit bureaus, banks, and insurance companies. What emerges is a computerized mirror of the American consumer, along with a catalog of mailing lists that has become almost comic in its diversity and precision: people who frequently buy condoms, who've been turned down for credit, who undergo quarterly urinalysis, or who simply fit the classification of "opportunity seekers," a.k.a. suckers.

This electronic caste system provides the targets for two forms of solicitation that Larson especially decries: direct mail and telemarketing. The power of the telephone and the mail to command our attention has been appropriated by marketers and turned against us, making their selling forays simultaneously more intimate and more intrusive. Equally maddening is the way marketers can now track our children's growth through a technique called synchrographics. For example, one major information reseller collects birth announcements from every newspaper in America. The babies grow up inside the computer, eventually moving into a high school student index and perhaps on to college, until they finally graduate to adulthood with their own listing in the phone book. Milestones along the way are marked by appropriate promotional offers, such as insurance for driving-age youngsters.

By fostering what Larson calls the Culture of the Second Guess, marketers



have come to concentrate their efforts on refining their selling techniques rather than their products. Ironically, they may have become too smart for their own good. Because of their targeted promotions and hell-bent couponing, companies have in effect reduced brand loyalty and blurred product distinctions. Relative performance has been overshadowed by relative price.

Larson contends that this game reduces creativity in the marketplace. Instead of developing new products on the strength of their own instincts and imagination, companies merely ask us what we want. As a result, today's manufacturers and marketers substitute pandering and short-term focus for the inspiration of new ideas.

### Protecting Privacy

As thorough as Larson's investigation may be (his sections on the Census Bureau and the Nielsen ratings are reminiscent of Melville's cetology chapter in *Moby Dick*), the sheer volume of his findings tends to inflate their actual impact. Horror stories notwithstanding, database marketing has a more diffuse effect in reality than Larson would have us believe, because the awesome power of this technology is focused not on one

person but on 250 million of them. There's no question that privacy can be invaded and civil rights trampled upon, but Larson may be overdramatizing when he warns that "the technology gives companies unprecedented power to muscle in on the 'sacred' corners of our lives, those personal events we treasure as ours alone, and to transform them into commodities for subsequent sale, rent, or barter." For most people, after all, database marketing still constitutes a nuisance rather than a full-fledged affront.

Another weakness is that Larson offers few practical suggestions regarding consumer protection. That's not entirely his fault, of course—the matching and profiling of countless databases presents a techno-knot that would be difficult for any non-hacker to untie. What Larson does propose is a new set of privacy laws that prohibit the transfer of information from one source to another without the consent of the individual. Taken to its extreme, however, such a restriction might bring commerce to a standstill, as even hard-core privacy advocates will concede. Larson also maintains that new guidelines should be grounded in a constitutional amendment guaranteeing privacy as an inalienable right—a further step beyond many of his fellow advocates, who prefer not to tinker with the Constitution.

Rather than pursuing such a difficult course, privacy expert Robert Ellis Smith recommends some day-to-day guidelines that are sensible, if arduous in their own way. He suggests that consumers investigate the practices of companies and do business with those providing the maximum privacy. Beyond that, he says, "don't fill out every line on every form—skip over the marketing questions and fill out only the bare minimum needed. Ask to see information that companies have on file so you can correct it. Don't give out your Social Security number unless absolutely necessary, and don't reveal personal information over the phone on incoming calls."

Quibbles aside, there's no denying the substance of Larson's thesis. And he



doesn't even take into account the thriving black market among infosellers, where you can easily obtain Julia Roberts's unlisted phone number or Dan Rather's credit-card receipts. As *The Naked Consumer* makes clear, the day may be approaching when database marketing will be more than just an annoyance to [YOUR NAME HERE]. ■

JOHN CARROLL is head of Carroll Creative, an advertising consulting firm in Boston, as well as a columnist for AdWeek and a commentator for public radio station WBUR-FM.

## BOOKS

## SMALL WONDERS

*Taming the Atom: The Emergence of the Visible Microworld*  
by Hans Christian von Baeyer  
Random House, \$23

BY SIDNEY PERKOWITZ

ALTHOUGH nature enfolds the huge and the minute, and both extremes grew from the Big Bang, human reactions to the two could not be more different. Size creates awe, even primal dread. It is the need to find a niche amidst vast echoing spaces that drives us to understand the universe in the large. But we feel no cosmic dread of the small. Our desire to examine it comes instead from the ancient idea that to know the building blocks is to know all.

The path to the small is blocked by perceptual barriers that do not exist on the road to the large. One barrier is that the ordinary light that lets us examine clusters of galaxies is of too great a wavelength to discern anything so fine as an atom. And the quantum theory that describes the microcosm has its own perceptual pitfalls. Its seemingly confused melding of wave and particle is only the beginning. If we do stand in awe of the small, it is because we see its

complexities through so dim a glass.

In *Taming the Atom*, Hans Christian von Baeyer clarifies our vision. A theoretical physicist who shares his understanding in graceful prose, he guides us into the realm of atoms, the smallest bits of matter we can truly examine. Contrary to what we used to learn in grade school, it is now possible to "see" and "feel" individual atoms. This leads to the book's central message, or at least its main hope, that the new fineness of perception will help resolve the contradictions in quantum mechanics that have puzzled physicists from Einstein on.

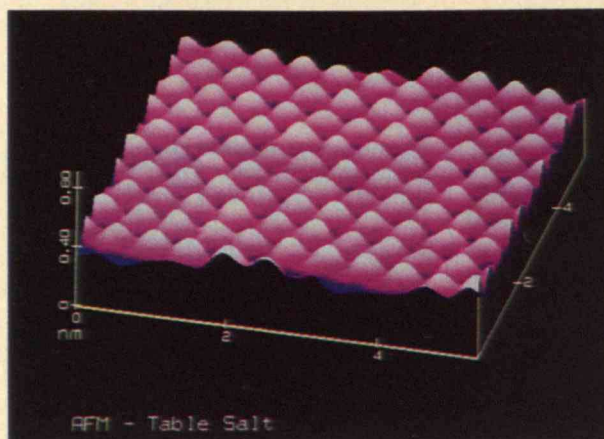
One new way of seeing described in *Taming the Atom* is the Nobel Prize-winning technique of scanning tunneling microscopy, in which a tiny metal stylus emits electrons to map the contours of a solid surface a few atomic diameters away. Although the resulting portraits of atoms provide an undeniable thrill, they do not yet offer enough detail to say much beyond "the atom is located there." Even when the resolution of our micro-cameras improves, exploring inner atomic workings will require that detailed pictures be combined with other experiments and mathematical analysis.

Nevertheless, von Baeyer believes that it is through these avenues that physicists will eventually come to understand such quantum enigmas as how electrons can behave both as waves and as particles. To illustrate this property, imagine that a beam of electrons encounters a barrier containing two parallel slits. If electrons were simply particles, some would flash through each slit in straight lines, like tiny bullets. The two streams exiting the slits would never meet; and even if they did, they could not cancel each other

out. But in fact the streams behave like waves, fanning out to meet and canceling each other's undulations at certain points in space. The resulting "interference pattern" appears as a set of alternating bright and dark lines on a fluorescent screen that intercepts the electrons, glowing where they hit, remaining dark where they do not. Yet at the same time, a detector at the screen emits discrete "pings" as if the electrons were arriving bullet by bullet.

This schizoid behavior is not good for physicists' peace of mind, and leads to even deeper unrest. Consider this scenario, which the author treats at length: Suppose the electrons come at such a leisurely pace that only one at a time encounters the twin slits, and many minutes pass before the next one arrives. As hours go by, the expected bright-dark striping of wave interference slowly forms on the screen. Why? Through some mysterious process, an electron acts as if it "knows" that it should avoid certain spots on the screen—thereby setting the stage for an interference pattern—long before its fellows arrive. No wonder the Nobel physicist Richard Feynman despaired that "nobody understands quantum mechanics." Only a brand-new concept, it seems, can free us from the tyranny of separate wave and particle. But although the author discusses experiments, especially in the area of superconductivity, that may yield this breakthrough idea, it remains hidden.

One promising avenue that von Baeyer does not tread in his search for the theory of the small is the study of technologies that are actually based on quantum mechanics. Experimental physicists like me find that quantum theory



*The geometric regularity of atoms in a crystal of table salt—once only an abstract notion—springs to life in an image produced by a technique known as atomic force microscopy.*



is woven into our daily scientific and technical life. The first time I tuned a carbon-dioxide laser, watching its intense light disappear at one wavelength and reappear at another, I felt a shock as I saw the reality of quantized energy levels. Even the lowly light-emitting diode, a scrap of semiconductor cheap enough to decorate nearly every piece of electronic equipment made, applies the mysterious quantum principles. Its electrons act as both particle and wave to generate another strange amalgam, the combined wave and particle of light.

But it is the cutting edge that is most likely to hold the solutions to quantum puzzles. We can now construct matter virtually atom by atom to make better superconductors for efficient use of electricity or artificial semiconductors for faster electronic devices. These custom-made materials become micro-laboratories where the quantum world can be more readily examined—to answer old riddles, but also to produce materials that may be more useful still. In times when pure science is bluntly asked to give an accounting of itself, it is bracing to think that we can improve technology for society while investigating the roots of the microcosmic.

Where does this leave the other end of the scale? In the long view, there is no distinction: the quantum must somewhere join the galaxy, perhaps in a theory of quantum gravity, perhaps at the core of a black hole. But the two extremes are already linked in a satisfying way, because we use the small to seek the large. Telescopes, our cosmological probes, "see" with electronic sensors that gently coddle the few photons arriving from distant sources. These sophisticated cousins of the light-emitting diode have reached their remarkable sensitivity through applied quantum mechanics and the use of techniques like scanning tunneling microscopy. Can anyone doubt that it is all connected? ■

*SIDNEY PERKOWITZ, the Charles Howard Candler professor of condensed matter physics at Emory University in Atlanta, writes frequently about science. He is at work on a book about how people perceive and use light.*

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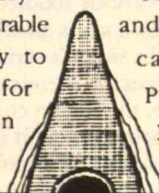
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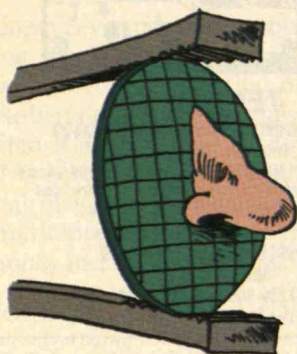
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# Notes



## Silicon Sniffers

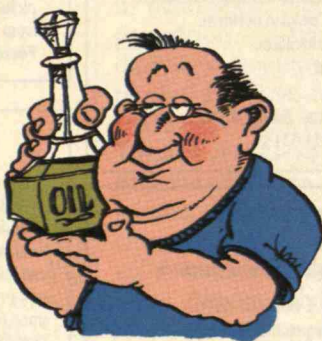
As if they weren't accomplished enough, silicon chips are about to branch out from the computer business into the field of chemical detection. By exploiting a recently discovered property of the thin wafers, researchers at the University of California at San Diego (UCSD) have devised a sensor that can precisely measure even trace amounts of common toxins in gases and liquids.

The device is based on the fact that when the surface of a silicon chip is sculpted by an oxidizing agent into a forest of ultrathin pillars and stimulated by a light source, it will emit an orange-yellow glow. Water does not quench the luminescence because it beads up on the chip's surface, much the way it does on a Teflon skillet. But a number of compounds, including benzene, methane, alcohol, and carbon dioxide, are able to penetrate the porous surface—like oil on Teflon—and extinguish the glow. Using a spectrophotometer to precisely measure luminescence changes when the chip bathes in a liquid or gas, the device registers just how much of these chemicals are present.

By using various oxidizing agents, the researchers are able to fine-tune the silicon's surface affinity for specific chemicals. For example, the silicon chips in UCSD's prototype unit detect small amounts of alcohol, but nothing else. They could

conceivably be used as the basis of a more practical breathalyzer, in which simple light-emitting diodes could serve as the light source and an inexpensive light detector could measure luminescence changes. Current breathalyzers are bulky contraptions that beam infrared light through a chamber filled with breath vapor. Because alcohol absorbs infrared light while water does not, the device can determine the ratio of alcohol present.

As the researchers continue experimenting with the surface chemistry of porous silicon chips, they envision a host of potential applications including devices that measure benzene in groundwater, methane gas in mines, and carbon dioxide in submarine air.



## Fighting Fat with Fat

When asked to name foods that help lower cholesterol, most people would undoubtedly think about garden salads but not about the dressings that they pour over them. But according to researchers at Cornell, one of the most popular salad dressings, olive oil, may be an effective weapon in the fight against heart disease.

In lab experiments that exposed live cells in culture to a variety of common dietary fats, olive oil was the only one that did not suppress the production of lipoprotein lipase, an enzyme responsible for breaking down fat molecules so they

can be absorbed as food by the body. When fat molecules accumulate in the blood they must be taken up by the liver, which responds by secreting compounds that form the precursors of cholesterol.

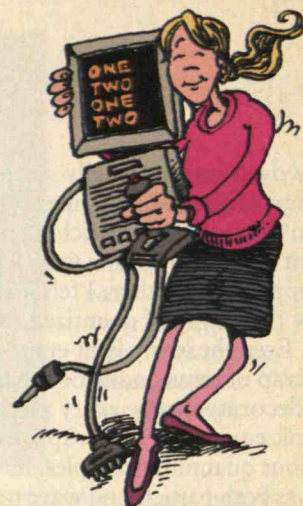
The study represents the first time that an oil has been shown to play a significant role in regulating the breakdown of dietary fats.

## Toward Non-Violent Computer Games

If you are trying to interest a girl in computer technology, don't ask her to play a computer game. That's the conclusion reached by Evelyn Rozanski, a professor in the graduate Department of Information Technology at Rochester Institute of Technology, who recently investigated why the ratio of women in computer science programs has dropped from nearly 40 percent in the 1980s to less than 10 percent in the 1990s.

Women who studied computer science in the 1980s were usually first exposed to computers at a time when the few games that existed, like Pong and Pac Man, were fairly generic and appealing to both girls and boys. Conversely, most women attending college in the 1990s were inundated during childhood and adolescence with male-oriented computer games that promote violence and stereotypical macho values. Girls not only turned off to these games, says Rozanski, they turned away from computers and, ultimately, careers in computer science.

Besides developing non-violent games that might appeal more to girls, software manufacturers should consult with teachers and gender experts to create better educational software for both sexes, Rozanski contends. Innovative programs



that offer alternative ways of looking at math and science concepts, for example, would not only leave girls with a favorable impression of computers, she says, but would help them learn the subjects essential to pursuing a career in the field.

## Label Warning

No one would dispute the desirability of warnings when consumer products can cause potentially dangerous problems. But according to researchers at the University of Michigan, the very separateness of warning labels may render them useless.

Manufacturers typically employ conspicuously large and colorful type to underscore warnings in a prominent location on the label, says J. Paul Frantz, a doctoral candidate in the university's industrial and operations engineering program. "But because people tend to focus only on information that helps them complete a task," he says, "separating the warning from the directions increases the chances that people will filter out the safety message."

Frantz studied how subjects responded to a variety of labels as they used potentially harmful household products. He found that explicit safety precautions included within the directions produced compliance rates six times higher than those on the original labels.



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